ELECTRICAL WEST

May 1947
25 cents

Heat Pump Report, Page 61
Appliances, Page 106

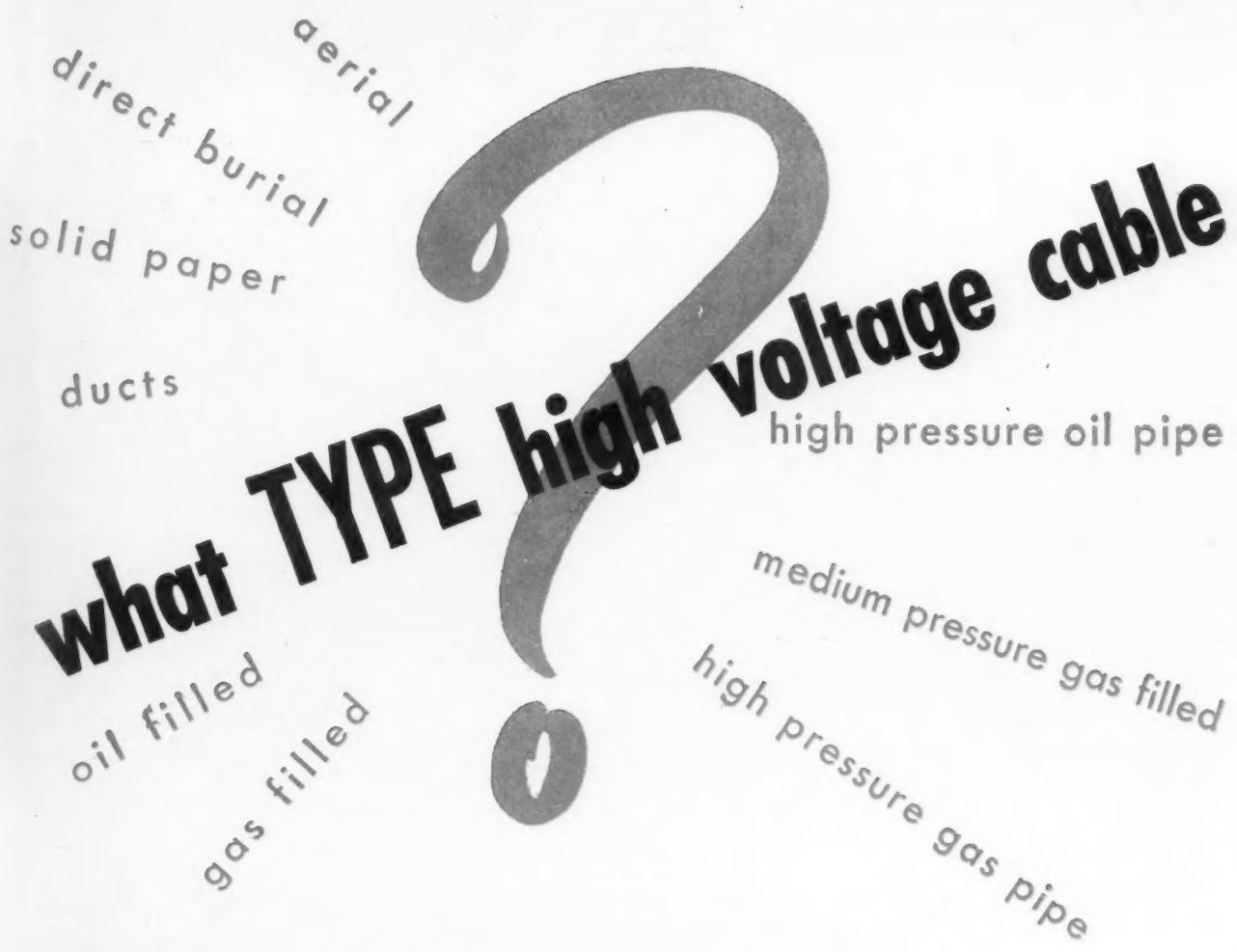
SMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

Model electric kitchen designed and built by the Edison Company's display department.

To help more Southern and Central Californians "live electrically and enjoy the difference," the Edison Company now has an Electric Home Planning Department. This department helps contractors, architects, and builders who are planning new homes or are modernizing wiring systems in existing homes. Without charge, it develops modern electric kitchen plans and specifications and, when desired, makes perspective drawings which enable the housewife to better visualize her kitchen as it will look when completed.

Located in the general office, Los Angeles, the Home Planning Department also serves Edison's district Adequate Wiring Advisors.

SOUTHERN CALIFORNIA EDISON COMPANY



ANY TYPE MAY DO THE JOB

But only one will do it best

Today almost any of a number of high-voltage cables can be made to fit a given application. But for each problem there is invariably one best answer.

To aid cable engineers in choosing this best solution, we retain recognized experts both in the field and at Schenectady. Intimate knowledge of utility problems and of the latest advances in high-voltage techniques have enabled them to regularly help utility men save time and money.

If you need high-voltage cable, let us add our judgment to yours in selecting the most economical type. *General Electric Co., Schenectady 5, N.Y.*

FOR COMPLETE **range of high-voltage types**
engineering service
system responsibility

GENERAL ELECTRIC

501-35

SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U. S.
The all-industry magazine of progress, established 1887, and incorporating the "Electrical Journal", "Journal of Electricity, Power and Gas" and "Journal of Electricity". Contents Copyright. Sixtieth year of publication.

PUBLISHED MONTHLY by McGRAW-HILL COMPANY OF CALIFORNIA

MAY 1947 Vol. 98, No. 5

ELECTRICAL WEST

James H. McGraw, Honorary Chairman of the Board
James H. McGraw, Jr., Chairman of the Board — George C. Tenney, President and Editor
W. A. Cyr, Associate Editor — Wayne H. Snowden, Engineering Editor
Peggy Boyer, Assistant Editor — R. A. Balzari, Publishing Counselor
Roy N. Phelan, Manager — John Cootz, Typography

ADVERTISING REPRESENTATIVES

Chicago (11).....William B. Heaps, 520 N. Michigan Ave.
Cleveland (15).....Frank J. Seiler, 1510 Hanna Bldg.
Los Angeles (14).....Don Hanson, 621 S. Hope St., MI 3873
New York (18).....Ralph H. Flynn, 330 W. 42nd St.
San Francisco (4).....Tom Carmody, 68 Post St., DO 4600

Report on Heat Pumps 61

ENGINEERING

A Year of Designing, Building, Operating Discussed 66
Snow Survey by W. A. Work and Paul A. Ewing 72

LIGHTING AND WIRING

Navy Gets Bright Lights and Safe Landings 75
How About These Underwriters? (Part I) by Howard Dodge 77

ASSOCIATIONS

Inspectors 95

SALES

It's Not Size That Counts 106
In Pueblo Electrical Dealers Set the Pace 116

DEPARTMENTS

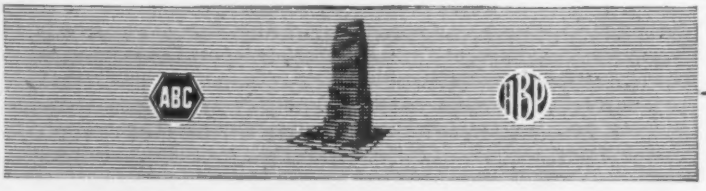
Associations	95	New Products (appliance)	122
Bulletins	54	New Products (other)	42
Editorials	104	News	128
Electra's Husband	58	Sales Guide	107
Letters	39	Sales Guide News Letter	111

Convention in Print

June will bring Electrical West's annual Convention-in-Print issue. Each year this issue includes a comprehensive report on some facet of electrical enterprise which is of especial timeliness as well as fundamental to the future of the industry as a whole.

This year the emphasis will be on energy potentials in the West, for almost every region is contending with the necessity for avoiding a power shortage and of looking ahead to determine where the energy needed to meet tomorrow's loads is going to come from. A survey of potentialities in the two great reservoirs of hydro power, the Colorado and the Columbia, will be a feature of this study.

Applying directly to each different electrical calling and equally fundamental will be a variety of other topics as: "Is electrical construction pricing itself out of the market?" "Do dealers need a national association, and why?" and "What is the sale and use of an appliance worth?" Another, "How about these co-ops now?" should open anyone's eyes to this growing taxless big business.



THE ELECTRICAL WEST EDITORIAL ADVISORY BOARD

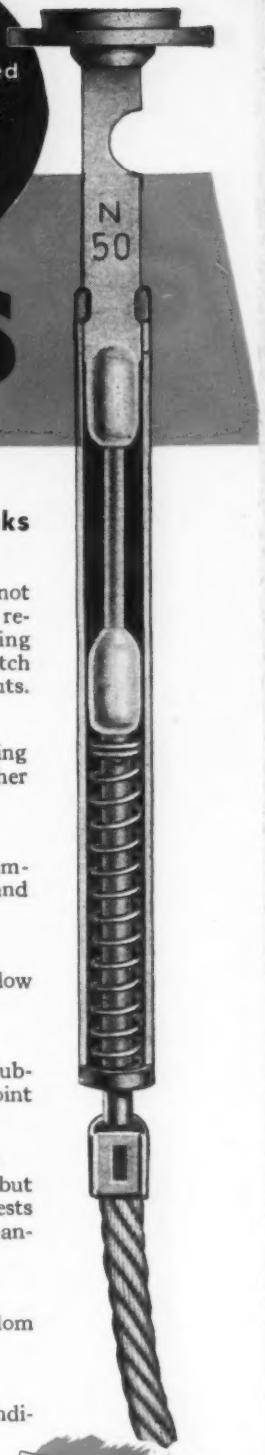
UTILITIES: R. E. Fisher, Vice-President In Charge of Public Relations and Sales, Pacific Gas and Electric Company, San Francisco; J. A. Hale, Vice-President, Utah Power & Light Company, Salt Lake City; Glenn L. Jackson, Vice-President and Commercial Manager, the California Oregon Power Company, Medford; Frank McLaughlin, President, Puget Sound Power & Light Co., Seattle; L. T. Merwin, President, Northwestern Electric Company, Portland; W. C. Mullendore, President, Southern California Edison Company Ltd., Los Angeles. MANUFACTURERS: J. H. Pengilly, Executive Vice-President, Square D Company, Los Angeles; C. A. Dostal, Vice-President, Westinghouse Electric Corporation; A. S. Moody, Vice-President, General Electric Company, Portland. WHOLESALERS: A. H. Meyer, Leo J. Meyberg Co., San Francisco and Los Angeles; Harry C. Gerster, District Manager General Electric Supply Corp., Seattle. CONTRACTORS: Teo L. Rosenberg, T. L. Rosenberg Co., Oakland; R. D. Horning, manager, Seattle Electrical Contractors Assn. DEALERS: K. L. Hampton, manager, Valley Electrical Supply Company, Fresno; J. C. Chamberlain, Sec'y-Mgr. Bureau of Radio and Electrical Appliances, San Diego, California.

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), May, 1947. Vol. 98, No. 5. Published monthly by McGraw-Hill Co. of Calif. Price 25 cents a copy. Publication Office, 621 So. Hope St., Los Angeles 14, Calif. Executive and Circulation offices, Electrical West, 68 Post St., San Francisco 4, Calif. Entered as second class matter April 17, 1947, at the post office at Los Angeles, Calif., under the Act of March 3, 1879. Printed in U.S.A. Subscription rates—U. S., U. S. Possessions and Latin American Republics: $2, 1 year; $3, 2 years; $4, 3 years. Canada: $2.50, 1 year; $5, 3 years. Other countries: $3, 1 year; $5, 2 years; $6, 3 years. Copyright, 1947, McGraw-Hill Company of Calif. All rights reserved.

What to look for in fuse links

to meet your problems in sectionalizing . . . coordination . . . protection

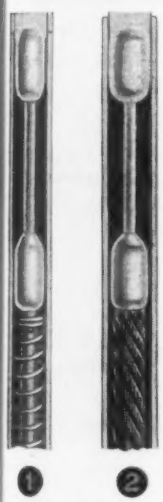
The link with the one piece forged button and shank and the die-cast fusible section



To insure dependable accuracy use

L-M UNIFIT FUSE LINKS

Line Material makes a complete line and a full range of fuse links to fit all NEMA-standard fuse cutouts and meet all types of fusing problems. But what is important to the user is the long experience of Line Material, the familiarity of its engineers with fuse link requirements, and the extreme attention paid to assuring the dependability and accuracy of these products.



Spring or Strain Types? L-M Makes both

❶

SPRING type with tin (1 to 50 amps.) or silver (5 to 50 amps.) fusible section: The spring is helpful in these smaller sizes to extinguish the arc more rapidly.

❷

STRAIN type with tin (5 to 200 amps.) or silver (60 to 100 amps.) fusible section: Here the arc is heavy enough to force the gases from the fibre tube rapidly, and blow the arc out quickly.

Die-Cast Construction: L-M tin links, in the 25 to 100 ampere sizes, both strain and spring types, are made in the exclusive L-M die-cast construction in which the fusible section is die-cast around the strain wire and onto the fuse button and leader.

Tin or Silver? L-M Makes both

Each type has desirable characteristics. Tin with a lower melting point, is ideal for *both* overload and short circuit protection; silver is desirable for short-circuit protection only.

Other Features of L-M Unifit Fuse Links

Forged One-Piece Button and Shank
Head and shank forged in one piece. Head cannot pull off; joint cannot loosen and corrode or cause resistance and heating. Cadmium-plated. Rating stamped on top of button and side of shank. Notch in shank permits use in certain types of cutouts.

Short Arcing Time
assured by substantial fibre enclosing tube, giving best possible coordination with breakers and other fuses.

Mechanical Strength.
Fusible section is protected against mechanical damage by fibre (not paper) tube—able to withstand handling, shipping, etc.

Ideal Speed
—fast enough to coordinate well with breakers; slow enough to coordinate well with other fuses.

High Rupturing Capacity
obtained by small mass of fusible section and substantial arcing terminals of higher melting point copper.

Individual Testing Assures Extreme Accuracy.
Not one in a hundred, or one here and there, but *every* link is individually tested. Electrical tests assure accurate rating. Strain tests assure mechanical strength.

Extra Flexible, *Tinned* Leader
assures ease of operation, good appearance, freedom from corrosion.

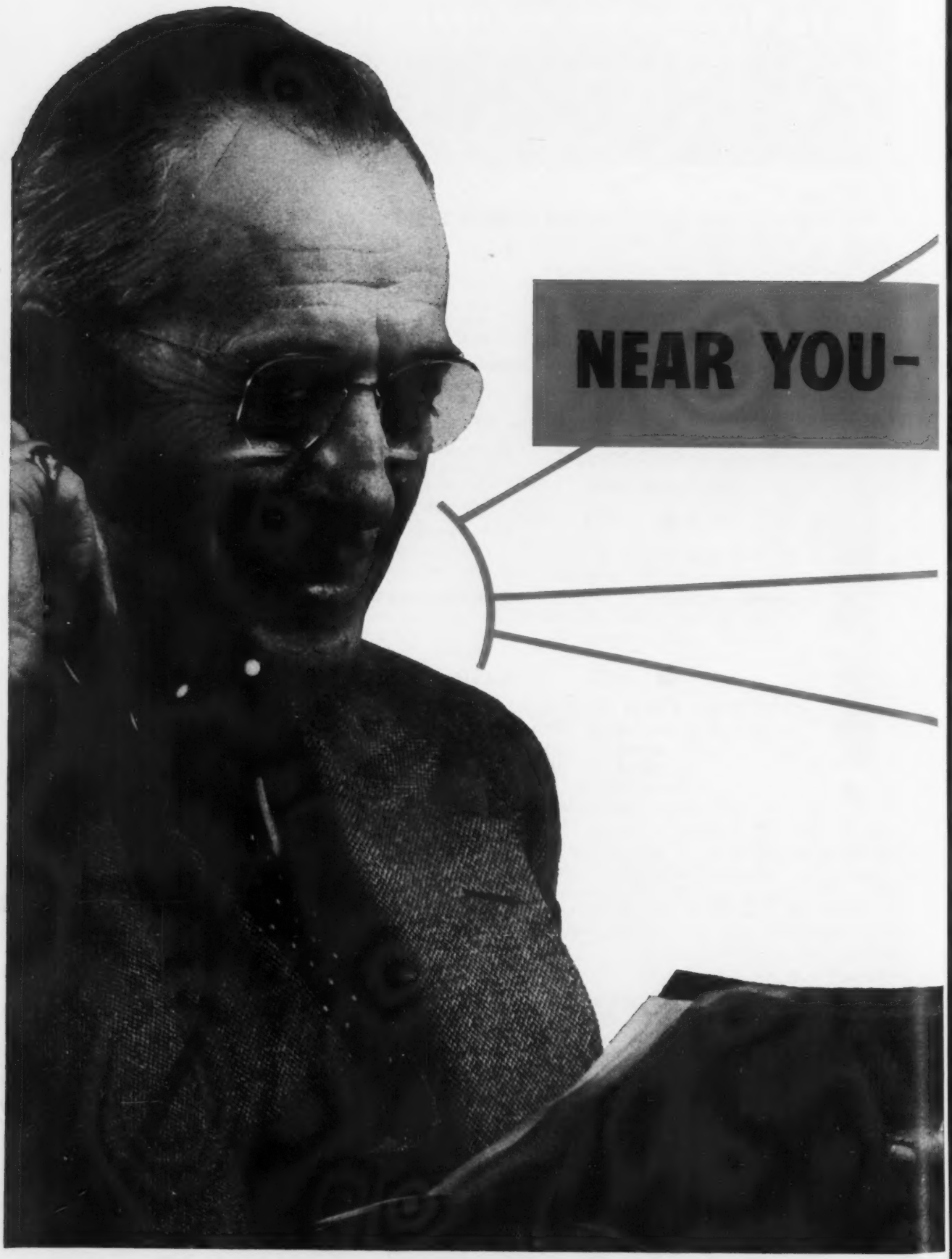
Convenient flat
no-roll water-resistant cartons hold five links in individual compartments.

For Complete Information and Help on fusing, discuss your problem with the L-M Field Engineer. He has ample information and broad experience.

If you prefer, *write* for the information you need. If you are concerned with coordination, ask for the very complete technical bulletin, "Fuse Coordination". *Address* LINE MATERIAL CO., *Milwaukee 1, Wisconsin.*

LINE MATERIAL
FUSE CUTOUTS & FUSE LINKS

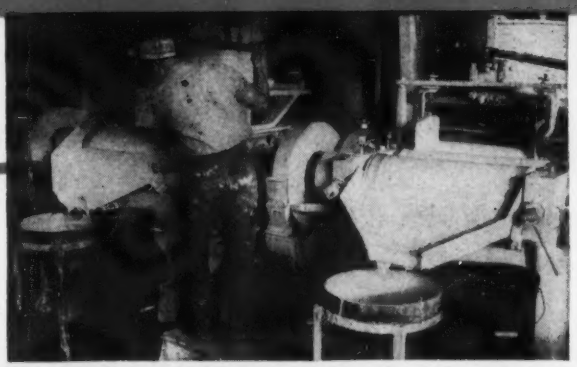
L-M DISTRIBUTION EQUIPMENT INCLUDES: Distribution Transformers • Fuse Cutouts and Fuse Links • Lightning Arresters • Oil Switches • Pole Line Hardware • Line Construction Specialties • Underground Equipment • Fibre Conduit • Street Lighting Equipment


NEAR YOU-

FULLER

laboratories, factories and inventories strategically placed to give prompt service to all Western Industry

Wherever you are in the West



And, Gentlemen, that means something for every Western manufacturer!

Pick up your phone—call FULLER—and *right then* you have working for you one of the finest groups of paint chemists in the country.

If it's one of hundreds of Fuller's standard, high-quality items—Fuller trucks load from warehouses near you. If it's a special specification for a tough finishing job—you have immediately available all the knowledge, skill and attention of the West's foremost paint product technicians.

Call Fuller first! From there on out it's up to us—and we like it just that way.

W. P. FULLER & CO.

Factories in San Francisco... Los Angeles... Portland
Branches and Warehouses throughout the West

Leadership through Research

INDUSTRIAL FINISHES DIVISION

Advanced research and product control contribute to our record of delivering specific finishes for specific purposes. Your individual production finishes problem gets the undivided attention of our technicians and sales-service men.

PLANT MAINTENANCE DIVISION

Now—better than pre-war exterior and interior finishes for woods, metals, brick, concrete or stucco. And investigate "Color Engineering"—it's the modern way to reduce plant working hazards, increase plant working morale.

Leader FLUORESCENT LUMINAIRES *Meet the Challenge of* EDUCATION

Leader VL—440—45° cut off. An especially fine fixture for classroom use. Low surface brightness with proper diffusion give pleasing soft light. Modern design for new modes in architecture.

An interesting, informative sound film on lighting trends, sales methods, potential markets. Make a date soon with the friendly Leader representative in your area to see and hear this new film.

EDUCATORS EVERYWHERE agree that in all branches of education—the vocational schools, the halls of learning in prominent universities, even in the little red school-houses—there is a crying need for better classroom lighting.

Leader has met this challenge to the lighting industry by extensive research and careful design of fluorescent fixtures for educational use. For better lighting to safeguard the sight of America's youth—for fixtures with lower surface brightness that raise the level of light above the students' eyes—Look to Leader.

Only better electrical wholesalers and contractors distribute and install Leader fluorescent fixtures.

LEADER ELECTRIC COMPANY

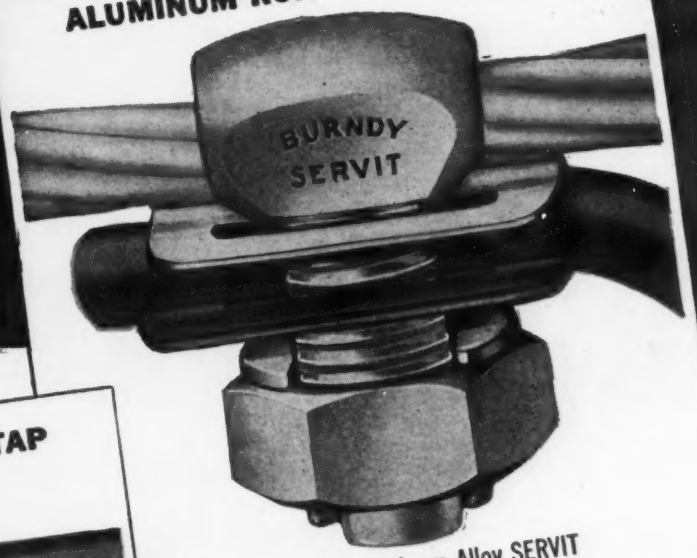
6129 NORTH BROADWAY • CHICAGO 40, ILLINOIS

WEST COAST FACTORY • 2040 LIVINGSTON ST., OAKLAND 6, CALIFORNIA

SERVIT

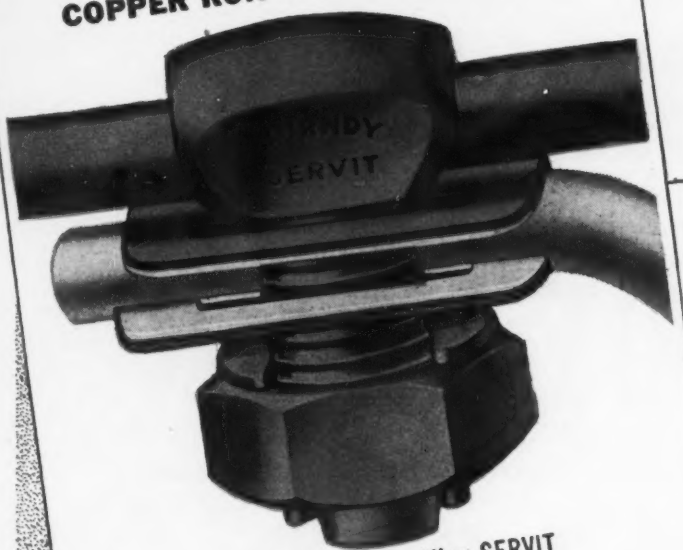
for ALUMINUM runs or taps!

ALUMINUM RUN — COPPER TAP



The forged Aluminum Alloy SERVIT with Copral* washers (KSAKF)

COPPER RUN — ALUMINUM TAP



The forged Copper Alloy SERVIT with Copral* washers (KSKF)

For aluminum to aluminum connections, the SERVIT is furnished in either the forged aluminum alloy type KSA, or the plated copper alloy SERVIT KSL. Thus the popular SERVIT is available for *all* conductors, and any *combination* of conductors! Send for complete information.

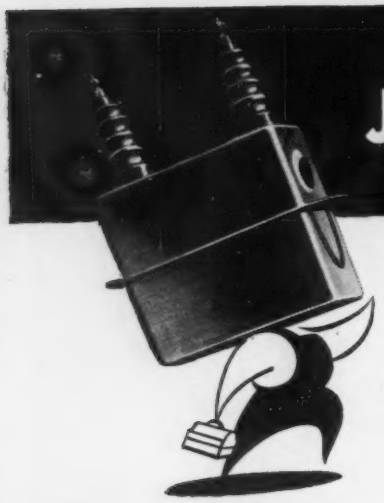
*Burndy COPRAL bi-metallic washers can be purchased separately, and used with SERVITS where required.

BURNDY

New York 54, N. Y.

IN CANADA: Canadian Line Materials, Limited, Toronto 13

WESTERN BRANCH • VERNON, CALIFORNIA



JOHNNY CAPACITOR'S

KWHR LOSSES FROM KVAR TRANSPORTATION MAY EQUAL ⅕ OF YOUR DOMESTIC LOAD*

KILOVAR ECONOMICS #2

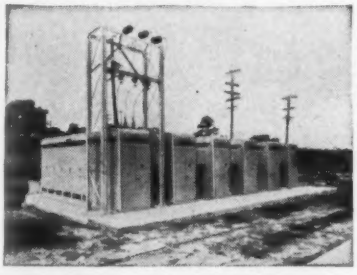
Johnny says:

With load increases eating into reserve carrying capacity—and with costs of both fuel and equipment going up—*the losses caused by kilovars are now more costly than ever before?*

Energy losses due to kilovar transportation can actually exceed 1/5 of your domestic load. Reducing these losses by supplying on-the-spot kilovars from capacitors offers exceptional savings and advantages today, for these reasons:

1. Capacitors are now low in cost—less than $10 per kilovar installed.
2. Increased system capacity is made available immediately, as soon as on-the-spot kilovars are supplied.

That is the dollars and cents side of the story. Important system improvements also result. Voltage drops throughout the system are reduced. More kilowatts per ampere can be delivered. Distribution circuits are cleared for carrying increased pay load.



Your General Electric representative will be glad to explain in further detail the specific advantages of applying capacitors to *your* system. Or write to *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

LOTS OF COMPANIES ARE DOING IT NOW!

There are 8 million kilovars of capacity installed throughout the country. Typical of the companies now taking advantage of on-the-spot kilovar generation are Oklahoma Gas and Electric Company, with capacitors equal to 20 per cent of their peak load; Public Service Company of Northern Illinois—10%; Public Service Electric and Gas Company—16%; Illinois Power Company—18%. Why not use capacitors as an economic tool in *your* system planning.

**It's a matter of simple arithmetic*

1. Total energy losses generally approximate your domestic load.
2. Ratio of copper losses to total energy losses approximate 50%.
3. At 80% Power Factor, 60% kilovars are flowing.
4. The % of copper losses due to transporting kilovars is therefore $\frac{(60)^2}{(100)} = 36\%$.
5. Therefore 36% of 50% equals 18% (or, in round numbers, 1/5 of your domestic load).

GENERAL ELECTRIC

407-113-5700

Kearney Fuse Links

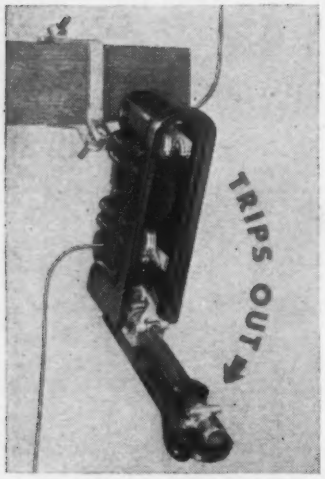
● Lower Fuse Costs
● Provide Close Coordination

KEARNEY patented Fuse-Paks keep fuse links in perfect condition. Each link separately wrapped, cannot become tangled or bent. Convenient carton protects against damage from dropping or rough handling. Eliminates loss due to breakage—and bulk packaging often causes losses as high as 30%.

Save Time in Stock Room. Fuse-Paks are easy to store—easy to dispense. Ratings are clearly marked—simplifies counting inventory.

Convenient for Troubleman. Handy package hooks onto belt or slips into pocket. Fuse links are held in the Fuse-Pak—they cannot fall out, they must be *pulled* out. No loss of time due to installing damaged link.

Close Coordination. Careful selection of materials, precision manufacturing, expert assembling and rigid inspection assures maximum uniformity. You are assured of close coordination when you use Kearney Fuse Links. Specify Kearney for all your fusing needs. They are available for all modern types of cutouts.



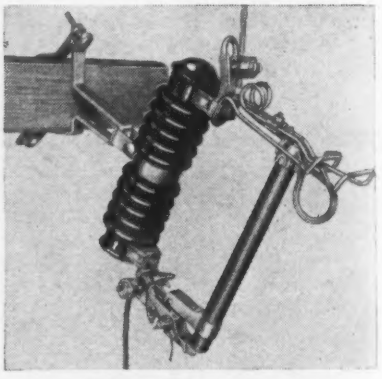
7500 Volt, 100 ampere Kearney TRIP O MATIC Catalog No. 5770—20

Kearney TRIP O MATIC

Reduce losses due to unnecessary service interruptions. Design features include ease of fusing, and visual indication when an outage occurs. Convertible to disconnect switch by using door with solid blade. Available in 50 and 100 ampere sizes, 5 and 7.5 KV.

Kearney TRIP-OUT

Simple trip-action mechanism assures positive interruption on overloads as well as short circuits. Point pressure contacts assure good conductivity. Re-fusing is quick and easy. Available in ratings 5 to 69 KV, 100 and 200 amperes.



7500 Volt, 100 ampere Kearney Trip-Out, Series B, Catalog No. 6739

For Better Results

Specify Kearney Products

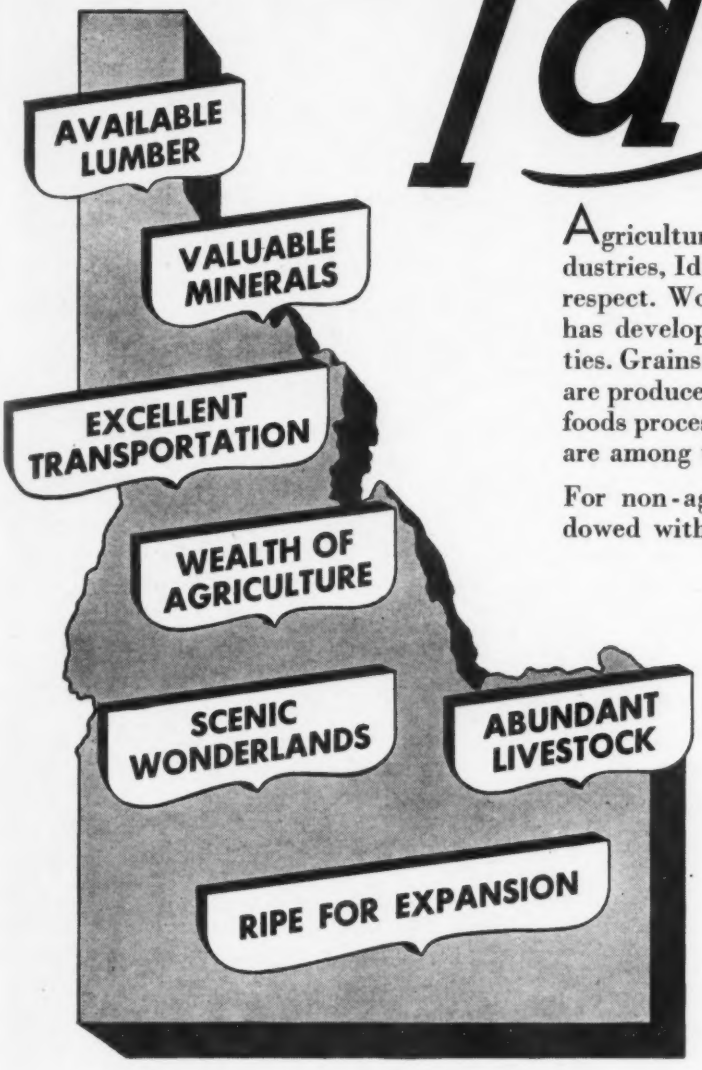
OVERHEAD AND UNDERGROUND UTILITY EQUIPMENT

MAYDWELL & HARTZELL
INCORPORATED
LOS ANGELES • SAN FRANCISCO • PORTLAND

UNION PACIFIC

TREASURE MAP OF INDUSTRY

Idaho*

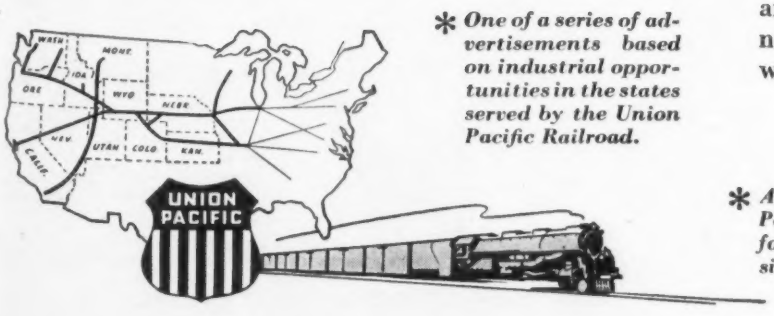


Agriculture being the life-blood of many industries, Idaho is particularly fortunate in that respect. World-famous for the Idaho potato, it has developed many other agricultural activities. Grains, vegetables, fruit... cattle and sheep are produced in abundance. Dehydration, frozen foods processing, dairying, canning and packing are among the state's flourishing industries.

For non-agricultural industries, Idaho is endowed with rich veins of minerals. Numerous manufacturers of stone, clay and glass products have established plants in Idaho. Lumber for building and wood products is available. Unsurpassed rail transportation is provided by Union Pacific.

As a vacation region, Idaho has a wonder-world of its own in Sun Valley . . . year-'round sports center... the world famous primitive area . . . and in the scenic surroundings of Payette Lake.

Idaho is a young thriving state, ripe for further industrial development. It offers good living and working conditions, good schools, splendid cultural advantages . . . and its energetic citizens assure newcomers of a true western welcome.



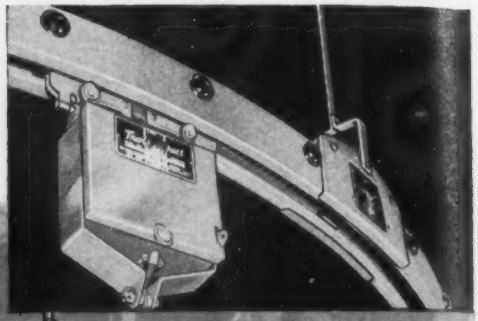
* *One of a series of advertisements based on industrial opportunities in the states served by the Union Pacific Railroad.*

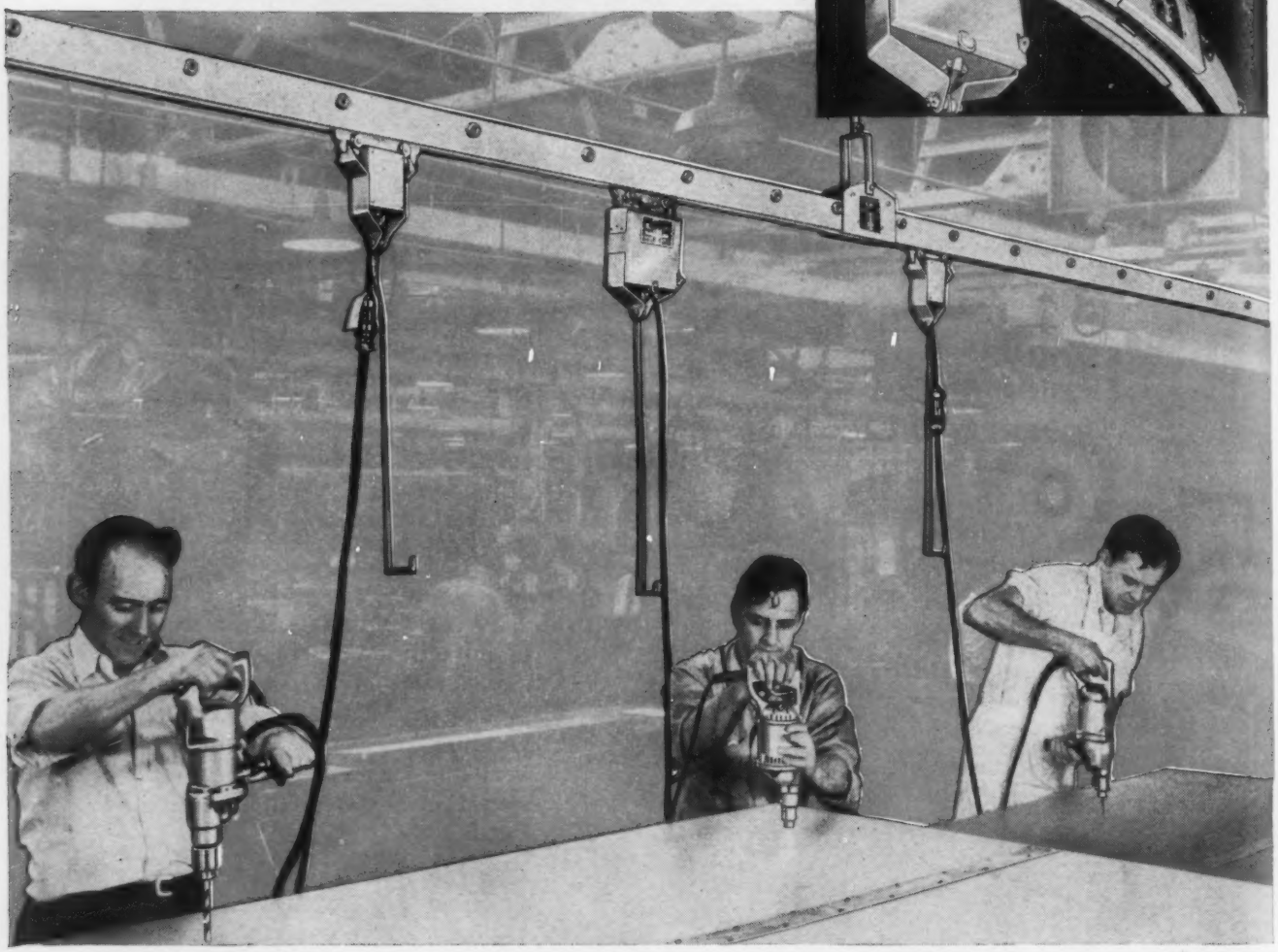
* *Address Industrial Department, Union Pacific Railroad, Omaha 2, Nebraska, for information regarding industrial sites.*

UNION PACIFIC RAILROAD

THE STRATEGIC MIDDLE ROUTE

Power takes a trolley ride*





POWER travels with the job when your cranes, hoists and portable tools are electrified by BullDog Industrial Trol-E-Duct.

It takes only an eight-ounce pull to put power at a workman's elbow—with no danger from entangling extension cords and no possibility of accidental contact with "live" wires.

The moving trolleys, collecting current from bus bars enclosed in a rigid steel duct, provide a source of power that is safe, convenient and economical.

Slotted its entire length, Industrial Trol-E-Duct provides a continuous electrical outlet that completely eliminates the need of rewiring or adding new fixed outlets. Maintenance costs are minimized, because all current-carrying bus bars are firmly supported in the duct casing and long extension cords are unnecessary.

Your plant can have all the advantages of this modern electrical distribution system if you consult a BullDog Field Engineer right away. He'll give you full technical information and show you a BullDog installation near your own plant. Or, if you'd like descriptive literature, write BullDog direct.

***With BullDog Industrial Trol-E-Duct**

ADEQUATE WIRING SERVES AND SAVES

BULLDOG

ELECTRIC PRODUCTS COMPANY

BullDog manufactures Vacu-Break Safety Switches — SafToFuse Panelboards — Superba and Rocker Type Lighting Panels — Switchboards — Circuit Master Breakers — "Lo-X" Feeder BUStribution DUCT — "Plug - in" Type BUStribution DUCT—Universal Trol-E-Duct for flexible lighting—Industrial Trol-E-Duct for portable tools, cranes, hoists.

Detroit 32, Michigan. Field Offices In All Principal Cities. In Canada: BullDog Electric Products of Canada, Ltd., Toronto.

CONSULT THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

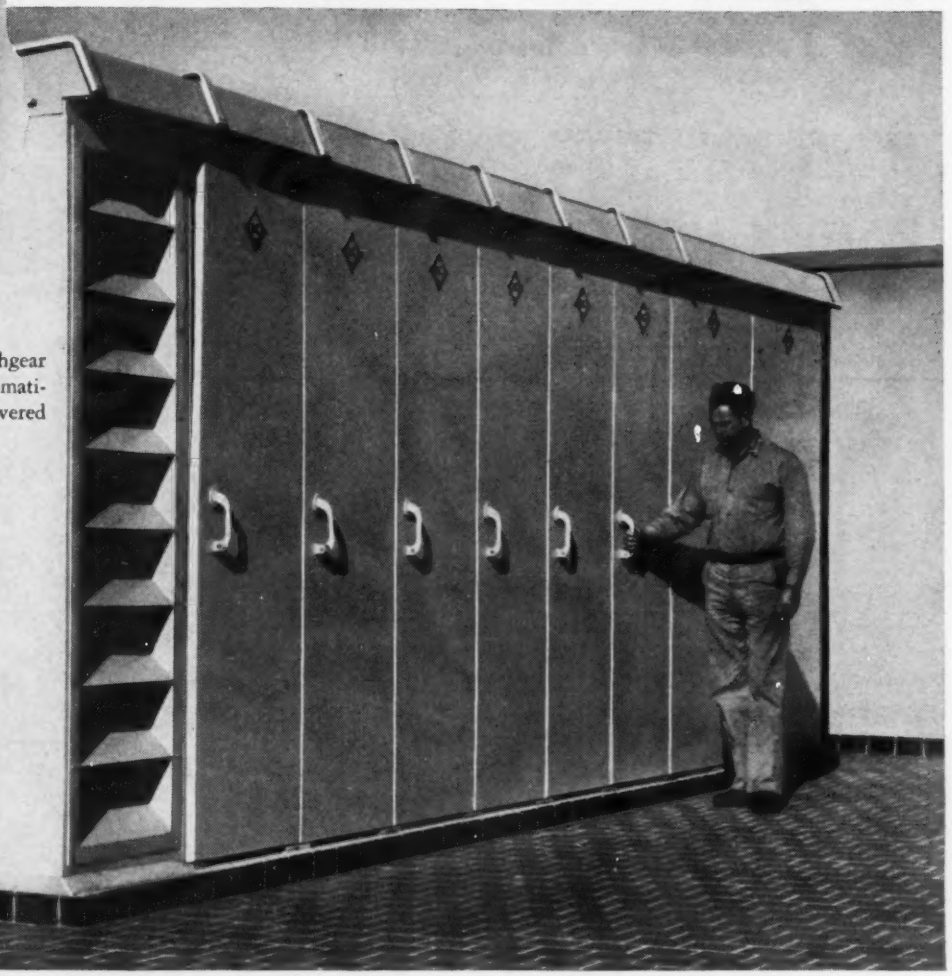
Coast Electric & Manufacturing Co.
1720 N. E. Sixth Avenue Tel. Garfield 2844
Portland, Oregon

Safety Switchboard Company
1445 Stevenson St. Tel. Hemlock 2470
San Francisco, Calif.

Mullenbach Electrical Manufacturing Co.
2300 East 27th Street Tel. Jefferson 2224
Los Angeles, Calif.

METAL-CLAD SWITCHGEAR

Ruptair equipped Metal-Clad switchgear is easy to inspect . . . contacts automatically disconnect when unit is lowered for inspection.



Protects Motors In West Coast Pump Station

SAFE, DEPENDABLE protection for 4000 hp synchronous motors is provided in this station by Allis-Chalmers *Ruptair* equipped Metal-Clad switchgear. *Ruptair* circuit breakers with capacities of 100,000 kva are designed for starting duty. Incoming line units, with capacities of 150,000 kva, protect the equipment against short circuits.

This installation is an excellent example of the modern and reliable switchgear you can expect when you bring your switchgear problems to A-C.

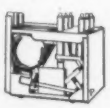
★ ★ ★

Allis-Chalmers pioneered the development of Metal-Clad switchgear and today builds a complete line for all applications. The next time you're faced with switchgear problems, call your nearest A-C office or write to ALLIS-CHALMERS, MILWAUKEE 1, WIS.

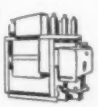
A 2231

Allis-Chalmers Builds all four Types of Circuit Breakers

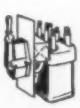
AIR BLAST available in interrupting capacities from 250,000 kva to 500,000 kva.



RUPTAIR... magnetic air type; interrupting capacities: 50,000 up to 250,000 kva.



MAGNETIC AIR. A-C trademark *Ruptair*. Capacities: 50,000 to 250,000 kva.



OIL — A-C trademark *Ruptor*. Capacities: 50,000 to 500,000 kva.

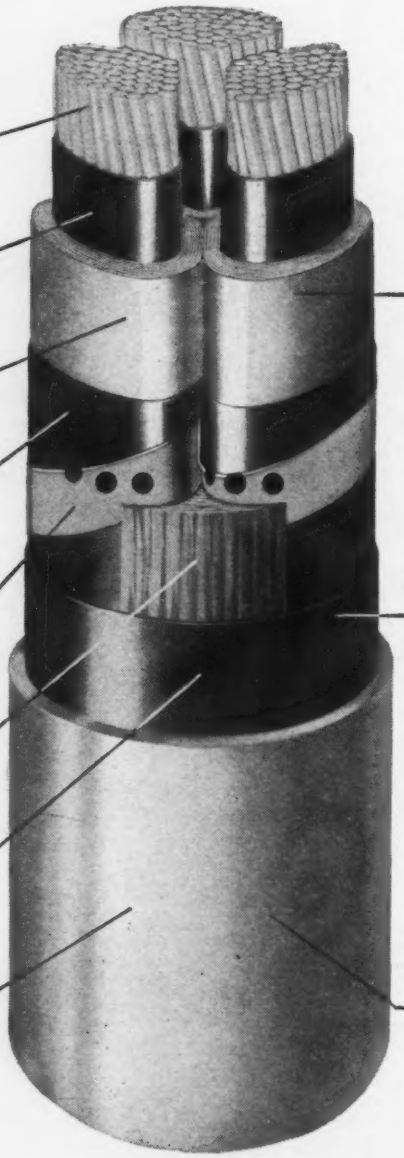
ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

1847 1947
A CENTURY OF SERVICE to Industry THAT MADE America Great

Anaconda TYPE CB* CABLE
FOR HIGHER LOADING

CONSTRUCTION **FEATURES**



CONDUCTOR

CB PAPER TAPE OVER CONDUCTOR

PAPER INSULATION

CB PAPER TAPE OVER INSULATION

COPPER SHIELDING TAPE INTERCALATED WITH **CB** PAPER TAPE

CB PAPER (OR PLAIN PAPER) FILLERS

CB PAPER BINDER TAPES

F-3 ALLOY SHEATH

1. PERDURABLE INSULATION

2. RESILIENT BINDER

3. INDEFATIGABLE SHEATH

Also available in single-conductor, multi-conductor belted and multi-conductor shielded cable with metal binder tape.

*CB = CARBON BLACK
Trade-Mark Registered

ANACONDA

ANACONDA WIRE AND CABLE COMPANY

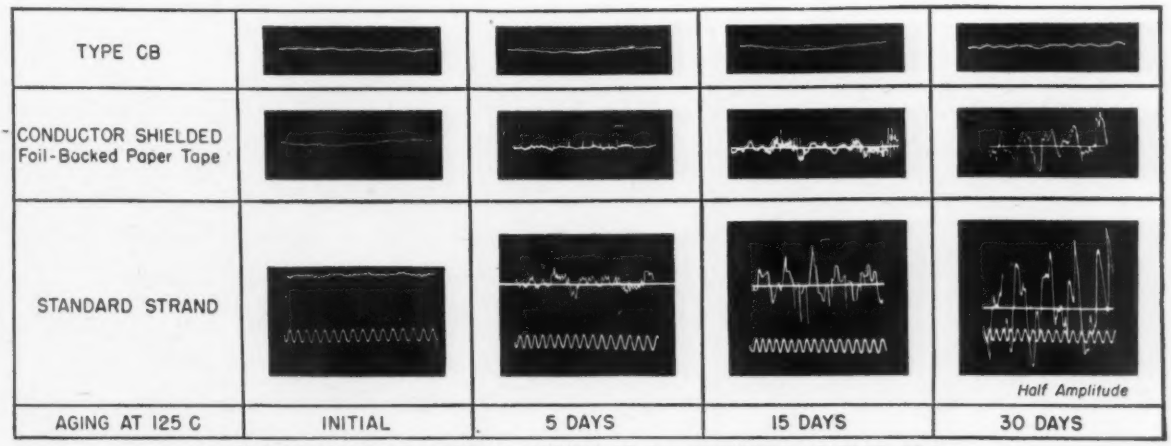
25 Broadway, New York 4, N.Y. Sales Offices in Principal Cities

AND F-3 ALLOY SHEATH
AND LONGER LIFE

ADVANTAGES

1. PERDURABLE INSULATION

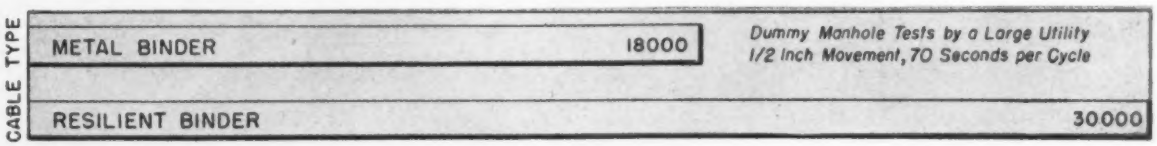
ELIMINATES IONIZATION (CORONA) DISCHARGES
INCREASES INSULATION STABILITY



OSCILLOGRAMS OF INTERNAL CORONA AT 2 X OPERATING VOLTAGE, 25 C

2. RESILIENT BINDER

CUSHIONS SHEATH
CONDUCTS RADIALLY
WITHSTANDS MECHANICAL STRESSES



AVERAGE LIFE TO SHEATH FRACTURE - CYCLES

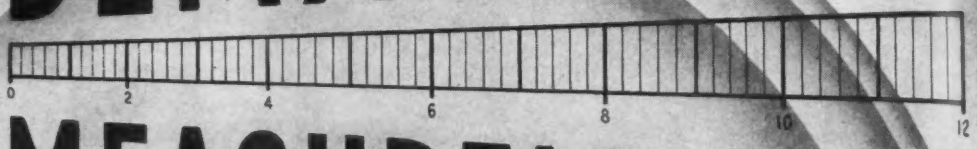
3. INDEFATIGABLE SHEATH

GREATLY INCREASES SERVICE LIFE
RESISTS SLOW-BENDING FATIGUE, CREEP (EXPANSION), BURSTING, ABRASION, VIBRATION, FATIGUE
REMAINS STABLE—PROCESSES SATISFACTORILY

AVERAGE LIFE TO SHEATH FRACTURE - CYCLES

References: AIEE Technical Papers 40-121, 46-115 and 47-91—Reprints available upon request.

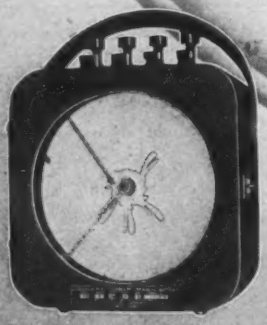
DEMAND MEASUREMENT



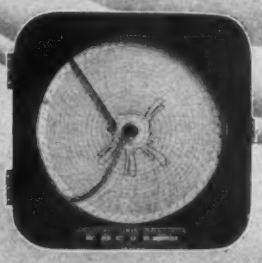
GIVES FACTS FOR DESIGNING RATES

SANGAMO DEMAND INSTRUMENTS

TO BE SOUND, rates must compensate for all costs, should develop profitable markets, should not be discriminatory, and should be applicable to loads widely varying in character. Best rate design is based on facts. Only measured facts are known facts. Sangamo Lincoln-Type Graphic Demand Meters provide accurate information as to the magnitude of demands, the time at which the demands occur, and their duration. Other Sangamo Demand Instruments are available in an extensive line—designed for your particular needs.



TYPE CCW
(Portable)



TYPE CCW
(Switchboard)

Sangamo Lincoln-Type CCW Portable and Switchboard Graphics are, respectively, top connected for temporary or test installations, and back connected for panel mounting.

TYPE CCW
(with terminal chamber on bottom)

Sangamo Lincoln-Type CCW Graphic Demand Meter provides an accurate, reliable, and economical means wherever a record of the time and duration, as well as the magnitude, of demand is required. A wide variety of indicating instruments is also available.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD • ILLINOIS

New Bulletin #852

ELECTRONIC TIMING RELAY

A Rugged Timer that Provides Accuracy under Frequent Service

This new Allen-Bradley electronic timing relay is designed primarily for machine tool and other applications where an accurate timer is required for frequent service. It has a range of 20 to 1, and is provided in eight timing ranges, with from one-half second up to two minutes maximum time delay. The reset time is approximately 1/10 of the maximum time delay.

The new Bulletin 852 A.C. Timing Relay possesses a high degree of flexibility. It can be recycled rapidly over long periods without affecting its performance in any way. The relay can be furnished with two normally open contacts, two normally closed contacts, or with one normally open contact and one normally closed contact. Write for complete information, Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

RELIABLE—Timing is always consistent because the operation of this relay is electronically controlled and does not depend upon any mechanical action.

EASY ADJUSTMENT—Timing is adjusted by a simple turn of a knob to the desired calibration. The relay will always reset to this adjustment.

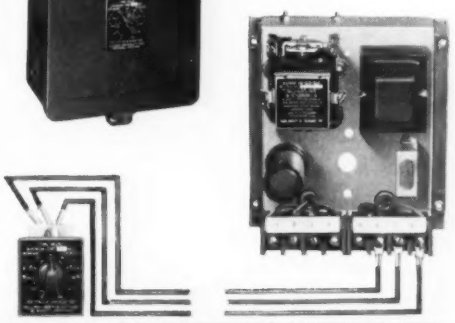
UNAFFECTED BY VOLTAGE—Line voltage changes of 10% or less have no effect on the timing operation.

REMOTE ADJUSTMENT—Timing control potentiometer and dial may be removed as a unit and mounted separately for control from a distance.

INDUSTRIAL RELAY—A rugged A-B industrial type solenoid relay is used for switching, eliminating a common source of electronic timing relay trouble.

VIBRATION-PROOF—The chassis has rubber mountings which isolate the relay from vibration and shock.

ENCLOSED VIEW



Also for REMOTE ADJUSTMENTS

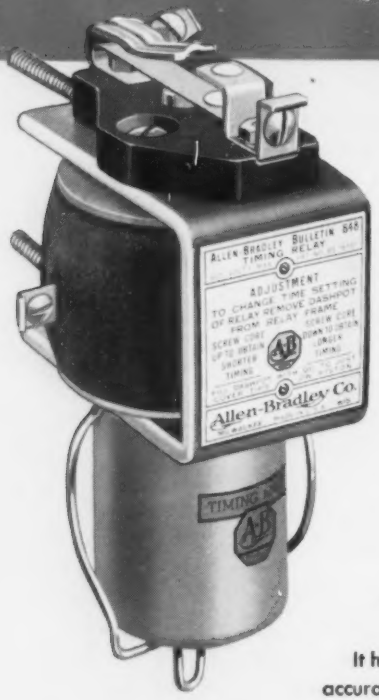
A-B Quality

ALLEN-BRADLEY

QUALITY

MOTOR CONTROL

THREE OTHER RELIABLE ALLEN-BRADLEY TIMING RELAYS


ALLEN-BRADLEY BULLETIN 848 TIMING RELAY
ADJUSTMENT
TO CHANGE TIME SETTING OF RELAY REMOVE DASHPOT FROM RELAY FRAME
SCREW CORE UP TO OBTAIN SHORTER TIMING
SCREW CORE DOWN TO OBTAIN LONGER TIMING
Allen-Bradley Co.
TIMING

Bulletin 848
FLUID DASHPOT TIMING RELAY

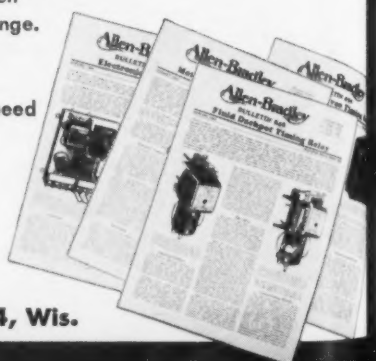
This magnetic type relay is simple, dependable in operation, and inexpensive. It can be used in many applications where reliability is more important than exactness of timing. With the new dashpot fluid used in this relay, operation at ambient temperatures from + 120F to —30F is possible without undue variations in timing. Has an adjustable range from 2 to 20 seconds. Available for a-c or d-c, in single-pole construction with either normally open or normally closed contacts.

Bulletin 849
PNEUMATIC TIMING RELAY

This solenoid type timing relay utilizes an adjustable pneumatic dashpot for controlling the tripping time. It has a range of from 1/6 second to 180 seconds and an accuracy of approximately ± 10%. While it has neither the accuracy nor the long timing range of a motor-driven timer, it is extremely reliable, and will give unusually good performance in timing most production cycles and similar machine tool applications. The relay is designed for 25 to 60 cycle operation, and has a single-pole, double throw switch.

Bulletin 850
MOTOR-DRIVEN TIMING RELAY

Designed for timing comparatively long intervals with a high degree of accuracy. Can be furnished in several ranges with maximum time delays of from 1 to 15 minutes. Variations in time between successive operations are less than 1% of the full scale range. For a-c pilot control service only. The single-pole switch can be connected for normally closed or normally open operation. Provides excellent service where high speed recycling is not required.



WRITE FOR DESCRIPTIVE BULLETINS
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

A-B Quality

ALLEN-BRADLEY

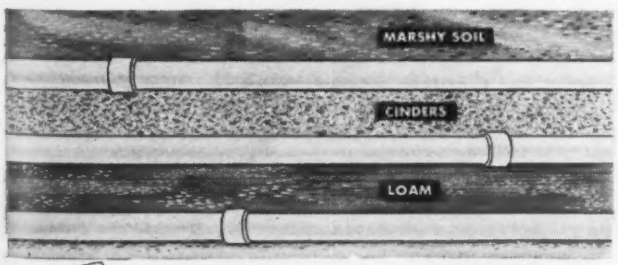
QUALITY

MOTOR CONTROL

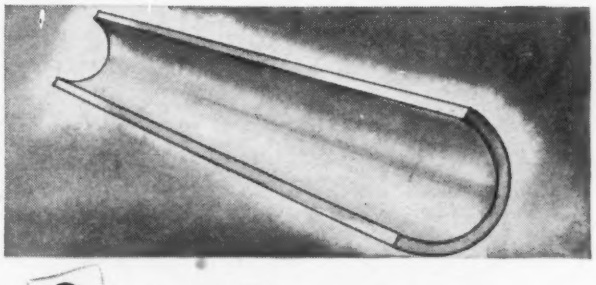
5 reasons why TRANSITE DUCTS help you CUT CABLEWAY COSTS

WHEN TRANSITE DUCTS go in, cableway costs go down. As the five reasons below will show—Transite Ducts are easier to install, require less maintenance, last longer and make cable insertion and replacement easier.

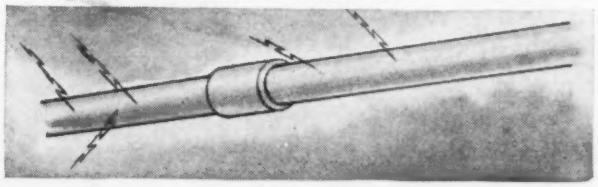
1 READILY INSTALLED . . . long, lightweight lengths and simple assembly method assure rapid installation.



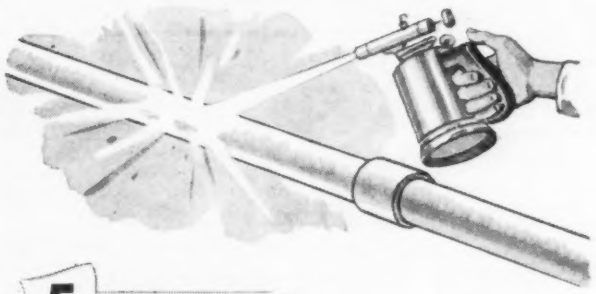
2 CORROSION-RESISTANT . . . because Transite is inorganic, it is unaffected by corrosive soils. Made of asbestos and cement compressed under great pressure, a construction which provides permanence and strength.



3 PERMANENTLY SMOOTH BORE . . . makes long cable pulls and replacements easy. Danger of damage to cables is minimized.



4 IMMUNE TO ELECTROLYSIS . . . being entirely inorganic and non-metallic, Johns-Manville Transite Ducts are not affected by electrolysis or galvanic action.



5 INCOMBUSTIBLE . . . won't contribute to formation of smoke, gases or fumes. If burnouts occur, these inorganic ducts provide maximum protection to adjacent cables and permit easy removal of damaged conductor.

Write for Data Book DS-410, Johns-Manville, Box 290, New York 16, N. Y.

Johns-Manville

There is an office near you

TRANSITE DUCTS
CONDUIT for use without concrete
KORDUCT for concreting in

The BIGGEST Improvement

CHANCE HOT LINE TOOLS

LIGHTER AUXILIARY ARM--EASIER TO ATTACH LESS BULKY
NEW--CHAIN TIGHTENER --WITH SAFETY LOCK--EASIER TO APPLY
DEAD END STRAIN CARRIER-- 20% LIGHTER
WIRE TONG SADDLE & CLAMP 2½ to 4 Lbs. LIGHTER

LIGHTER • STRONGER

Mechanically Improved

The A. B. Chance Company presents an outstanding contribution to the electrical industry —a complete new line of lighter, stronger, safer, mechanically improved maintenance tools with heat-treated aluminum alloy fittings—the *biggest* improvement in "Hot Stick" history!

The line has many new features that simplify operation and increase the versatility of the tools without increasing their weight. Every new tool has been proven *stronger* than the old design with heavy bronze fittings. All castings are rigidly inspected and production samples are regularly X-ray tested to guard against defects. All wood poles are voltage tested, to assure utmost safety, both before and after fittings are applied. Chance Hot Line Tools are now easier to use, faster in use, more versatile and more reliable than ever before.

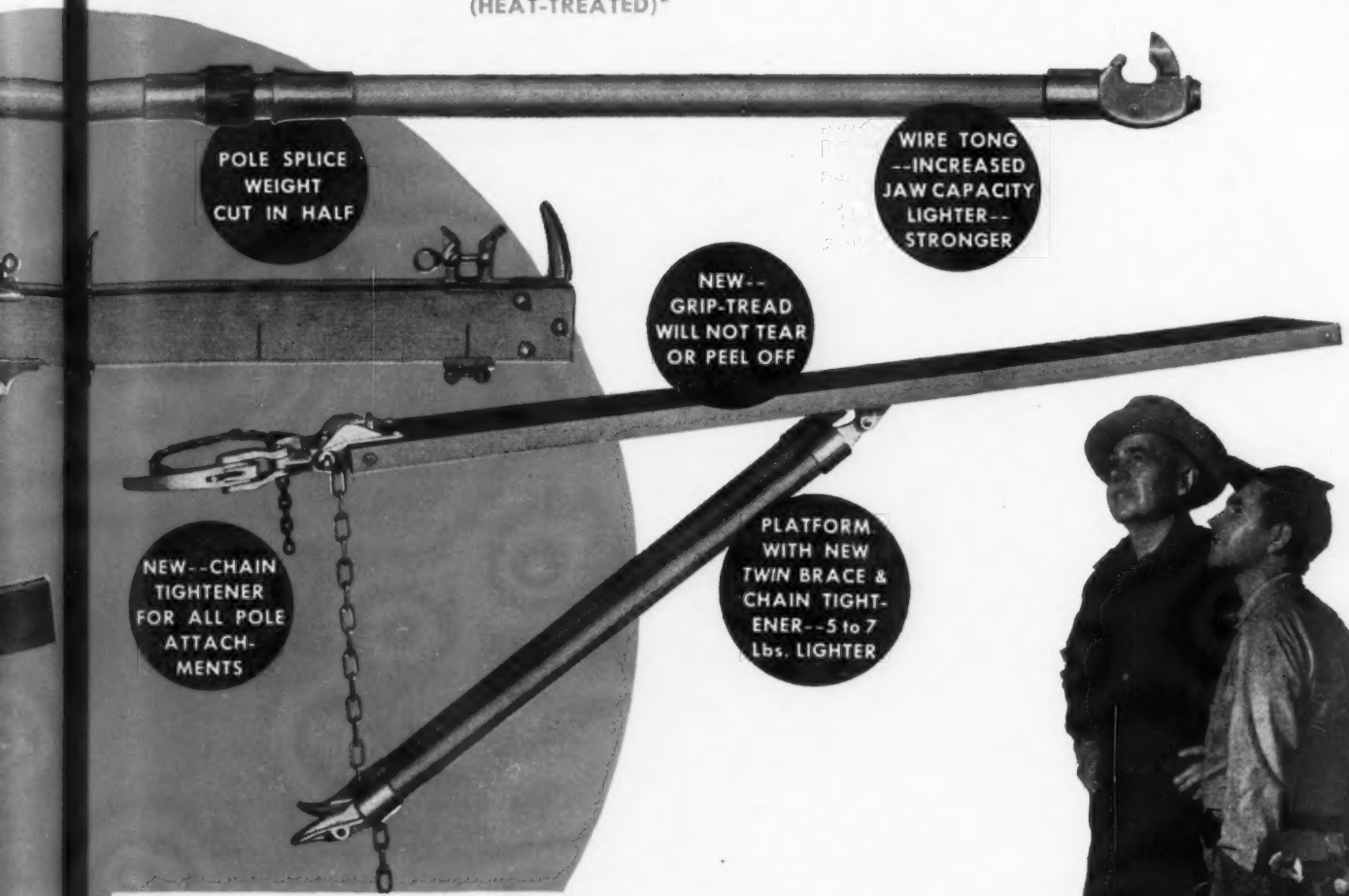
C478

CHANCE HEAT-TREATED ALUMINUM CASTINGS WERE USED IN ARMY AND NAVY FIGHTER AND BOMBING PLANES THROUGHOUT THE WAR . . . *THE SAME MANUFACTURING AND TESTING METHODS ARE USED IN MAKING CHANCE TOOLS TODAY

In "HOT STICK" History!..

with ALUMINUM Alloy Fittings

(HEAT-TREATED)*


POLE SPLICE WEIGHT CUT IN HALF
WIRE TONG --INCREASED JAW CAPACITY LIGHTER-- STRONGER
NEW-- GRIP-TREAD WILL NOT TEAR OR PEEL OFF
NEW--CHAIN TIGHTENER FOR ALL POLE ATTACH-MENTS
PLATFORM WITH NEW TWIN BRACE & CHAIN TIGHT-ENER--5 to 7 Lbs. LIGHTER

Reduced Weight Makes Hot Line Work

FASTER • EASIER • SAFER

Linemen, foremen, superintendents and safety directors who have handled these new Chance tools are enthusiastic about the many points of superiority they offer over all previous hot line tools.

Amazing weight reduction, with increased strength is made possible through the use of cast aluminum alloy fittings. Tests prove that a very slight difference in the weight of a tool head makes a considerable difference in the effort required to handle the tool from the butt end. This reduced weight minimizes fatigue and helps linemen do their work more quickly and efficiently and with less effort.

Some of the outstanding features of the new tools are indicated in the illustrations above. Extra strength—reduced weight—improvements in design—all mean faster, easier, safer line maintenance work.

Chance Aluminum Alloy Fitted Tools are now in production and will be available soon.

A·B·CHANCE CO·

CENTRALIA, MISSOURI · SAN FRANCISCO, CALIFORNIA

abc INDUSTRIES

This Name shows him what convenience means

This man is looking at a convenience outlet. He once thought that only a customer would find it "convenient." But now that he has changed to General Electric, he has discovered that easy handling and easy installation give extra meaning to that term. He has learned that this outlet, GE 2679 — and a wide variety of other General Electric wiring devices — have been designed to help make his job less difficult. Plaster ears are included to make mounting simpler. T-slots provide extra leeway in positioning. Durable brown or ivory color body improves appearance, and assures long service. Even more important, a wide range of sizes, types, and capacities allows him to select the proper outlet for any job from a single source of supply.

But the real convenience comes when this man (and thousands like him) mentions the name behind the product — General Electric. It gives *customers* extra faith in his good judgment. It helps *him* to be sure that the wiring he installs will give long-term service. And it makes it easy to order with confidence any item in the full line of wiring devices. Just say G.E., and he'll agree.

WIRING DEVICES by

GENERAL ELECTRIC

say "G.E." and he'll agree

Wiring Briefs from your G-E Distributors

Are you familiar with the great variety of products in General Electric's full line of wiring devices? Do you know the interesting features that help to make them easy to use and easy to sell? Keep an eye on this column, and you may discover a lot of useful facts and information. We'll keep dishing them out for you.

Here's the switch for nurseries, theaters, and other places where silence is important. So quiet that you can't hear it operate, this silent General Electric mercury switch has no moving parts to wear out. It's a top-quality product that goes a long way in pleasing your customers.

How often have you had customers complain because of faulty power cords on lamps and appliances? General Electric's durable Flamenol* cord sets put a stop to these complaints, because they practically never wear out. Strong, age-defying, easily cleaned Flamenol cords are equipped with molded-on plastic plugs that are virtually indestructible.

Preassembled at the factory, Flamenol cord sets are supplied with conductors stripped for speedy installation. Use them on all light appliances, to add the extra evidence of quality that is the hallmark of General Electric — and your best bet for satisfied customers.

Rural America is "going electric" fast. And now is a good time to remind you that General Electric makes a complete line of surface wiring devices to help you get a share of the profitable farm wiring business. G-E surface wiring devices are strong, light, easy to install, and popular everywhere for farm buildings, camps, garages, warehouses, or temporary wiring. Let us give you a descriptive folder.

If you want additional information on these, or other G-E Wiring Devices, ask us — your G.E. Merchandise Distributor — or write to Section D60-525, Appliance and Merchandise Department, General Electric Company, Bridgeport 2, Connecticut.

**Trade-mark Reg. U. S. Pat. Off.*

FACTS ABOUT *Irvington Silicone Varnished Fiberglas**

You can immediately secure Silicone Varnished Fiberglas electrical insulation which meets the property values listed:

TYPICAL TEST DATA

	.004"	.007"	.010"	.012"
Nominal Thickness				
Tensile Strength — lbs. P.I.W.	100	135	175	175
Weight per sq. yd. — lbs.	.27	.47	.66	.77
Specific Gravity	1.42	1.42	1.41	1.41
Dielectric Strength — V.P.M.				
¼" Electrodes — A — ASTM — 25°C.	1500	1500	1400	1300
¼" Electrodes — A — ASTM — 175°C.	1000	1000	900	900
Power Factor — 100°C. — Percent				
Conditioned 3 hours at 105°C.	1.0	1.0	1.0	1.0
Conditioned 24 hours at 65% R.H.	1.3	1.3	1.4	1.4
Dielectric Constant — 100°C.	3.5	3.5	3.4	3.4
Moisture Resistance				
% H_2O absorbed — 24 hrs. 65% R.H.	0.01	0.01	0.015	0.015
% H_2O absorbed — 24 hrs. immersion	0.70	0.60	0.55	0.55

Thermal Stability — Tests made on Silicone Varnished Fiberglas indicate that this material is stable up to 175°C.

Chemical Resistance: Silicone Varnished Fiberglas shows excellent resistance to most alkalies, such as 10% sodium hydroxide and concentrated ammonium hydroxide. A 10% solution of HCL and nitric acid showed no effect on Silicone Varnished Fiberglas.

Carbon tetrachloride, benzene and hot transformer oil (GE 10C) cause a softening of the Silicone varnish film.

THICKNESSES AND WIDTHS: Silicone Varnished Fiberglas is available in the following standard thicknesses: .004" (.002" base), .007" (.003" base), .010" (.004" base), .012" (.004" base). Standard full width rolls are 36" wide and 25 and 50 yards long. Also furnished in straight cut tape rolls ½" wide and up and in bias cut strips 51" long. Thicknesses other than standard are supplied on minimum orders of 100 yards.

*T. M. Reg. U.S. Pat. Off. by Owens-Corning Fiberglas Corporation

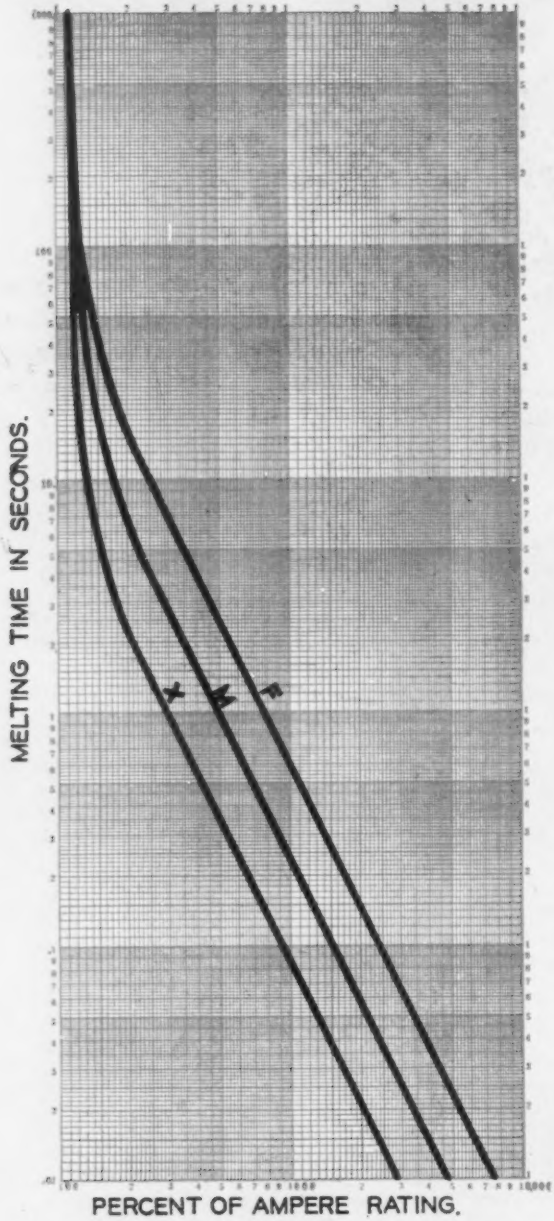
• For slot insulation, coil and cable wrapping — for high frequency equipment, transformers, and generators — for relays, rheostats, and resistors — as well as for a host of other electrical parts subjected to elevated temperatures, Silicone Varnished Fiberglas is unequalled. Investigate its use for your insulation problems. Write today for samples.

IRVINGTON

VARNISH & INSULATOR CO.

Irvington 11, New Jersey

for *Co-ordination...*



Three speeds in fuse links: Type F provides dependable slow operation; Type M, moderate speed in operation, and Type X, high speed operation. Note that all three links provide equal low overload protection.

PRECISION

Fuse Links

No matter what design . . . what alloy . . . is used to reach it, the Time-Current Curve in your fuse link is the characteristic which means dependable co-ordination! For over 15 years operating engineers have relied on Southern States ***soldered element fuses*** for protection against ***both*** high current faults and low current overloads.

Through the use of a solder alloy located in the center of the link, Southern States fuse links provide highly reliable protection against low overloads. This soldered joint is ***not*** simply a construction feature, but it is a distinct element in the establishment of the desired Time-Current Curve.

Southern States fuses are available in three speeds, providing greater flexibility for co-ordinating with breakers or other fuses. All NEMA "N," 100% Rated Links, these fuses are available in the universal type, adaptable to practically all expulsion fuse holders. Deliveries from stock in most standard ratings.

before LIGHTNING Strikes

Write TODAY for our booklet "Fuse Characteristic and Co-Ordination Data." Address your inquiry to Box 473, Hampton, Georgia.

Southern States Equipment Corp.

HOME OFFICE AND FACTORY — HAMPTON, GEORGIA

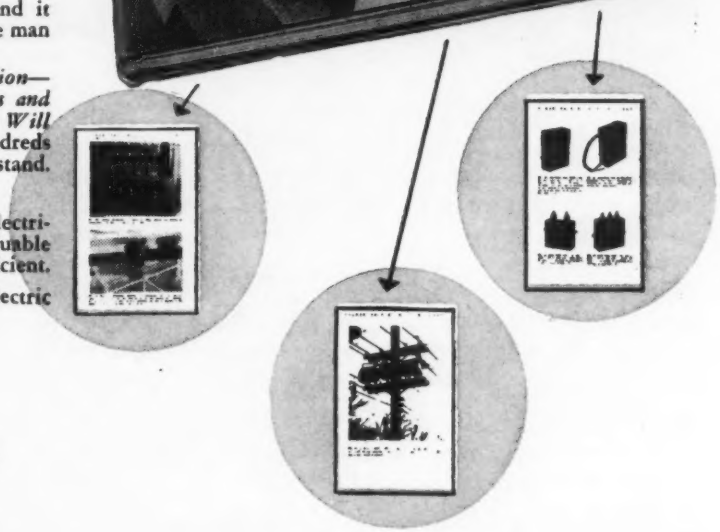
REPRESENTATIVES IN FOLLOWING CITIES:

BIRMINGHAM, ALABAMA
LOS ANGELES, CALIFORNIA
SAN FRANCISCO, CALIFORNIA
DENVER, COLORADO
WASHINGTON, D. C.
JACKSONVILLE, FLORIDA
MIAMI, FLORIDA
ATLANTA, GEORGIA
EVANSVILLE, INDIANA
VALPARAISO, INDIANA
LOUISVILLE, KENTUCKY
SHREVEPORT, LOUISIANA
BOSTON, MASSACHUSETTS
JACKSON, MICHIGAN
KANSAS CITY, MISSOURI
NEW YORK, NEW YORK
CHARLOTTE, NORTH CAROLINA
CLEVELAND, OHIO
PHILADELPHIA, PENNSYLVANIA
PITTSBURGH, PENNSYLVANIA
CHARLESTON, SOUTH CAROLINA
KNOXVILLE, TENNESSEE
MEMPHIS, TENNESSEE
DALLAS, TEXAS
HOUSTON, TEXAS
LUBBOCK, TEXAS
SALT LAKE CITY, UTAH
RICHMOND, VIRGINIA
SEATTLE, WASHINGTON
MILWAUKEE, WISCONSIN

At last—a Power Factor book in simple, understandable, down-to-earth language

THE ANSWER BOOK ON POWER FACTOR CORRECTION

Page Size — 6½" x 9¼"



No longer do you have to wade through page after page of high-powered mathematics to work out your power factor problems. This remarkable, 214-page volume gives you the answer to every power factor question in practical, everyday terms. It's written for working electricians — not college professors — and it approaches power factor problems from the viewpoint of the man who has to work with them.

How to Determine if You Need Power Factor Correction—and How Much... How to Save the Cost of New Feeders and Transformers... How to Determine if Motors or Capacitors Will Solve Your Problem Best... these are only a few of the hundreds of items thoroughly covered in language *everyone* can understand.

22 CHAPTERS—OVER 100 ILLUSTRATIONS

If you are a plant superintendent—maintenance engineer—electrician—designer—this unusual book will supply you with valuable information to make your job easier — your plant more efficient.

Mail Coupon for Your Copy TODAY! Cornell-Dubilier Electric Corporation, Dept. C5, South Plainfield, New Jersey.

Price $3.00

TYPICAL CHAPTER HEADINGS

- What Is This Thing Called Power Factor?
- What Effect Does Poor Power Factor Have On Electrical Equipment?
- How Do I Figure The Amount of Power Factor Improvement I Need?
- How Do I Determine the Power Factor in My Plant?
- Does Poor Power Factor Increase My Losses Very Much?
- What Effect Does Power Factor Have on Voltage Drop?
- When Should I Consider a Synchronous Motor Drive?
- Is It Cheaper to Use a Synchronous or an Induction Motor With Capacitors?
- How Much Correction Do I Get If I Run a Synchronous Motor at Part Load?
- What Does It Cost to Operate Capacitors?
- Tables and Charts that Save Time in Figuring.

PUBLISHED BY CORNELL-DUBILIER AS A SERVICE TO THOSE RESPONSIBLE FOR THE EFFICIENCY OF AMERICAN INDUSTRY

1910 CD 1947

CORNELL-DUBILIER

WORLD'S LARGEST MANUFACTURER OF

CAPACITORS

Don't wait . . . Mail coupon for your copy TODAY!

CORNELL-DUBILIER ELECTRIC CORPORATION, Dept. C5
South Plainfield, New Jersey

Please send Power Factor in Your Plant *by W. C. King to me at once.*

☐ $3.00 (Check or money order) enclosed. ☐ Send C. O. D.

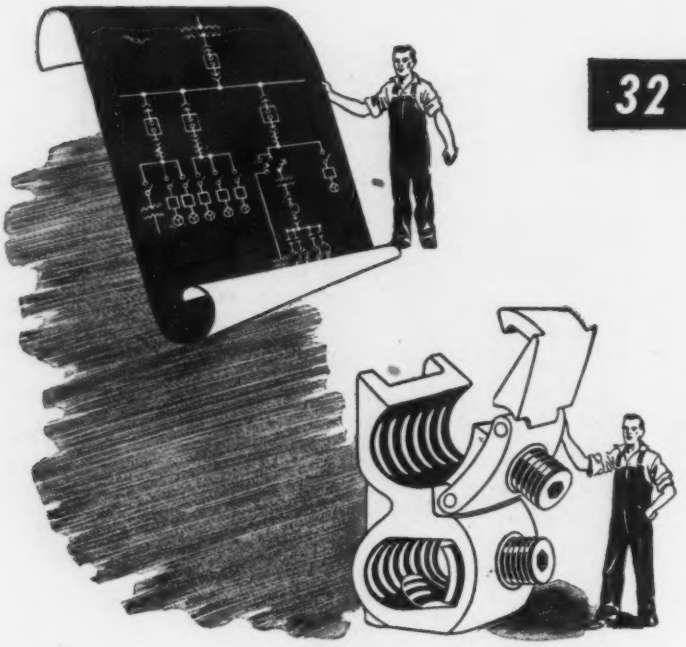
Name.....

Firm.....

Address.....

City.....Zone.....State.....

Orders accompanied by check or money order are shipped prepaid. All C.O.D. orders are plus postage costs.



32 connector sizes needed on this job!

One connector size is plenty with this new XTP!

For Tee or Parallel Taps!

ONE O. Z. FITTING DOES THE WORK OF 32

One typical XTP connector replaces up to 32 different parallel or tee connectors because each XTP accommodates a wide range of wire sizes. All told, the XTP line of but 25 connectors will receive *over 400 wire-size combinations!*

For either tee or parallel taps, just snap special hinged clamp over main and tighten—the connector is permanently in place, positive contact assured. When you're ready to connect the tap, simply insert wire in tap end of connector. A wrench-turn or two and the job's done!

25 CONNECTOR SIZES do practically all tap jobs.
- Accommodate over 400 combinations of wire sizes
- Fit wire from #8 to 1,000,000 CM

HINGED CONSTRUCTION for quick installation.

SPRING STEEL LOCKWASHERS (tin plated) maintain pressure.
- Hold resiliency—assure permanent connection

PRESSURE PLATES designed for maximum contact and grip.
- Serrated for firm grip
- Can not rotate during installation

HIGH STRENGTH, HIGH CONDUCTIVITY.
- High conductivity copper alloy for body
- Extra strength copper alloy for pressure plates and hinged parts

Get these new combination fittings from your wholesaler now . . . and put an end to bulky assortments of tap connectors.

CONDUIT FITTINGS • CABLE TERMINATORS
CAST IRON BOXES • SOLDERLESS CONNECTORS
GROUNDING DEVICES • POWER CONNECTORS

XTP as a "T" tap

XTP as a parallel tap

They're O. K. if They're O. Z.

O. Z. ELECTRICAL MANUFACTURING COMPANY

262 BOND STREET · BROOKLYN 2, N. Y.

Question: What type of electrical cable for all-around service is being widely used in metal-producing and other industries and particularly by the utilities?

Answer: *Okolite-Okoprene* cables, both single conductor and multi-conductor.*

Question: What kind of performance can be expected of Okolite-Okoprene cables?

Answer: *Millions of feet have been installed over the past 20 years and have proved long-lived.*

Question: Where may Okolite-Okoprene cables be installed?

Answer: *In ducts, or buried directly in the ground, or exposed to the elements.*

Question: Is additional protection needed?

Answer: *No.*

Question: What are some of the advantages contributed by the design of Okolite-Okoprene cables?

Answer: *Absence of tapes, braids or metallic coverings that rot or corrode. Perfectly-centered conductors. Uniform thickness of insulation and of covering. Uniform vulcanization throughout entire cable length.*

Question: What are some of the electrical operating advantages of Okolite insulation?

Answer: *High dielectric strength and moisture resistance. Stable characteristics. Low specific inductive capacity. High current carrying capacity. (75°C. copper temperature.)*

Question: What electrical characteristics are contributed by Okoprene, an Okonite-developed neoprene compound?

Answer: *Additional dielectric strength. Additional ozone resistance. High surface resistance which eliminates charging current drainage from cable surface.*

Question: What physical properties of Okoprene provide operating advantages?

Answer: *Lasting weather-resistance. Resistance to oil and solvents. Resistance to acids, alkalies and corrosive chemicals. Non-flammability.*

Question: How about installation?

Answer: *Okolite-Okoprene cables are simple to handle, splice and terminate. They require no potheads. They resist abrasion, are flexible at low temperatures.*

Question: Where can I find out more about Okolite-Okoprene cable and its relation to my problems of electrical distribution?

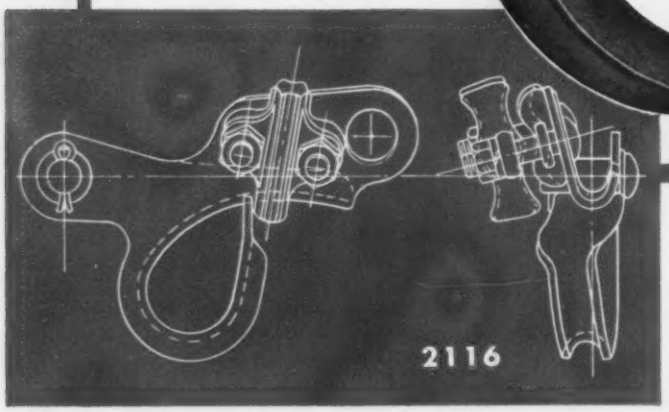
Answer: *By talking things over with a representative of The Okonite Company, Passaic, New Jersey or writing for Bulletin OK-2009.*

* U. S. Pat. No. 2,312,058

New Strain Clamp

FOR UNIVERSAL APPLICATION ON ANY TYPE OF CONDUCTOR

BTC



To complete the line of new Snubbing Strain Clamps for Rural, Distribution, and Light Duty Transmission Lines, the No. 2116 is designed for use on all types of conductors within its size range—0.160 in. to 0.550 in. (including armor tape when used).

The one-piece body without rivets or welds is pressed from High Strength, Corrosion Resisting Chrome - Nickle - Copper - Manganese Alloy Steel.

Reversible, double-wave keepers closely grip and hold, without slip, a very wide range of conductor types and sizes.

Light weight, short connecting length, smooth cable seat, long clamping section and large snubbing radii prevent conductor damage and minimize the effect of conductor vibration.

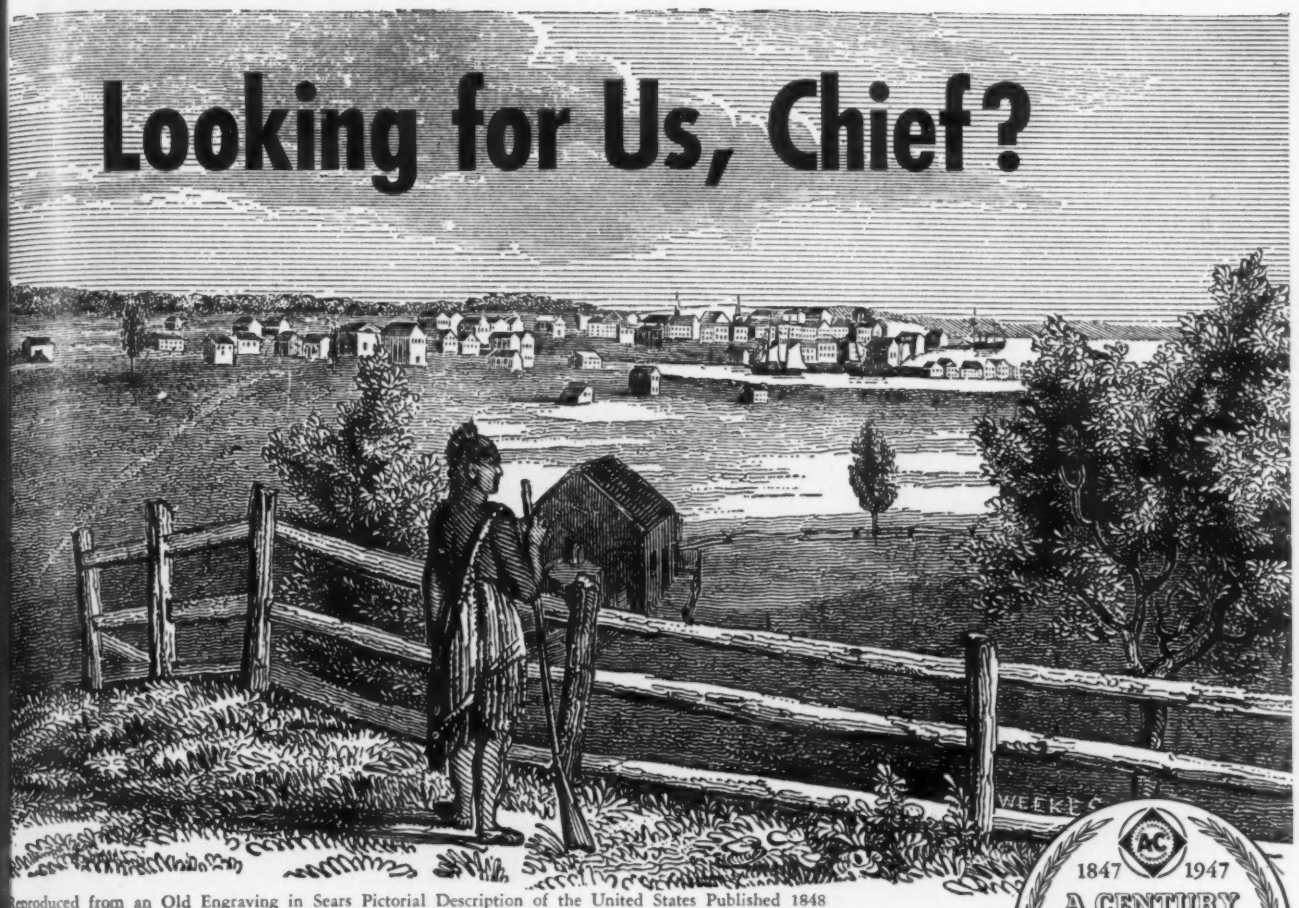
The ideal clamp for the utility regularly using several types and sizes of conductors — one clamp for all generally used distribution conductors.

Sold only through your insulator manufacturer

THE BREWER - TITCHENER CORPORATION

CORTLAND, N. Y.

Looking for Us, Chief?



Reproduced from an Old Engraving in Sears Pictorial Description of the United States Published 1848

1847 1947
A CENTURY OF SERVICE
to Industry
THAT MADE
America Great

WE WERE HERE WHEN MILWAUKEE WAS SPELLED M-I-L-W-A-U-K-I-E!

MILWAUKIE, 1847 — A frontier settlement celebrates its first birthday . . . and a small factory turns out its first product—*millstones.*

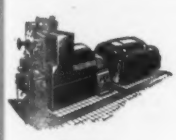
One-hundred years later, in 1947, this progressive city salutes its oldest heavy machinery manufacturer—Allis-Chalmers . . . *one of the Big 3 in electric power equipment—biggest of all in range of industrial products!* Today, practically every U. S. manufactured product is aided in its course by Allis-Chalmers equipment.

In building a *better* millstone, crusher, turbine, motor—Allis-Chalmers has earned the respect and confidence of men in every industry.

We are proud to serve this basic pattern of American life: Power and Electrical — Mining and Rock Processing—Ferrous and Non-Ferrous Metal Producing — Metal Working — Food — Textile — Chemical — Petroleum — Wood — Rubber — General Manufacturing — Transportation — Construction — Public Works — Agriculture — National Defense. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment
Biggest of All in Range of Industrial Products



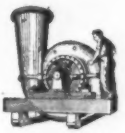
Power Generation . . .

Electrical Distribution . . .

. . . and Control Equipment

Texrope V-Belt Drives

Centrifugal Pumps

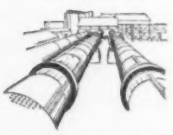


Blowers & Compressors

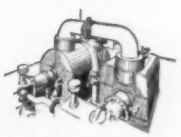
Crushing, Cement, Mining Equipment

Pulp, Paper, Saw-Mill Equipment

Food, Milling & Extraction Equipment



Chemical & Pyro-Process Equipment



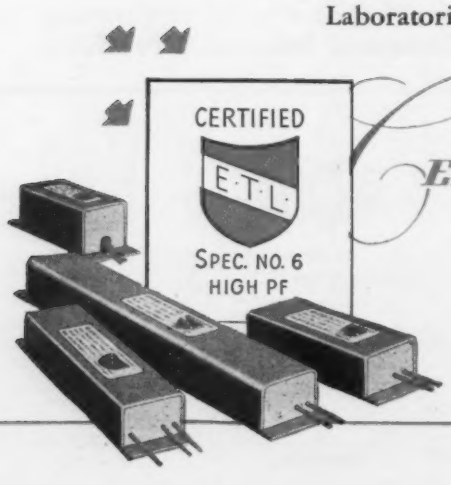
Marine & Defense Equipment

Farm & Industrial Tractors

A 2192

"There's more to fluorescent lighting performance than meets the eye!"

The BALLAST, the heart of good fluorescent fixture operation, is something the user *doesn't see,* and *shouldn't hear.* He's interested in trouble-free, satisfactory lighting performance. He doesn't want his fixtures to overheat . . . or hum like a belligerent mosquito. He wants his money's worth. The use of the *right* ballasts—CERTIFIED BALLASTS—mean protection and satisfaction not only for the user, but for the lighting people who supply him. Built to rigid specifications, CERTIFIED BALLASTS are tested, checked and re-checked by famous Electrical Testing Laboratories, Inc., to assure longer lamp life, most light from the lamps, and greater economy. Insist on the familiar ETL CERTIFIED Label on your ballasts!



CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting Fixtures

Acme Electric Corporation
Cuba, New York

Chicago Transformer Div.
Essex Wire Corporation
3501 Addison St., Chicago, Illinois

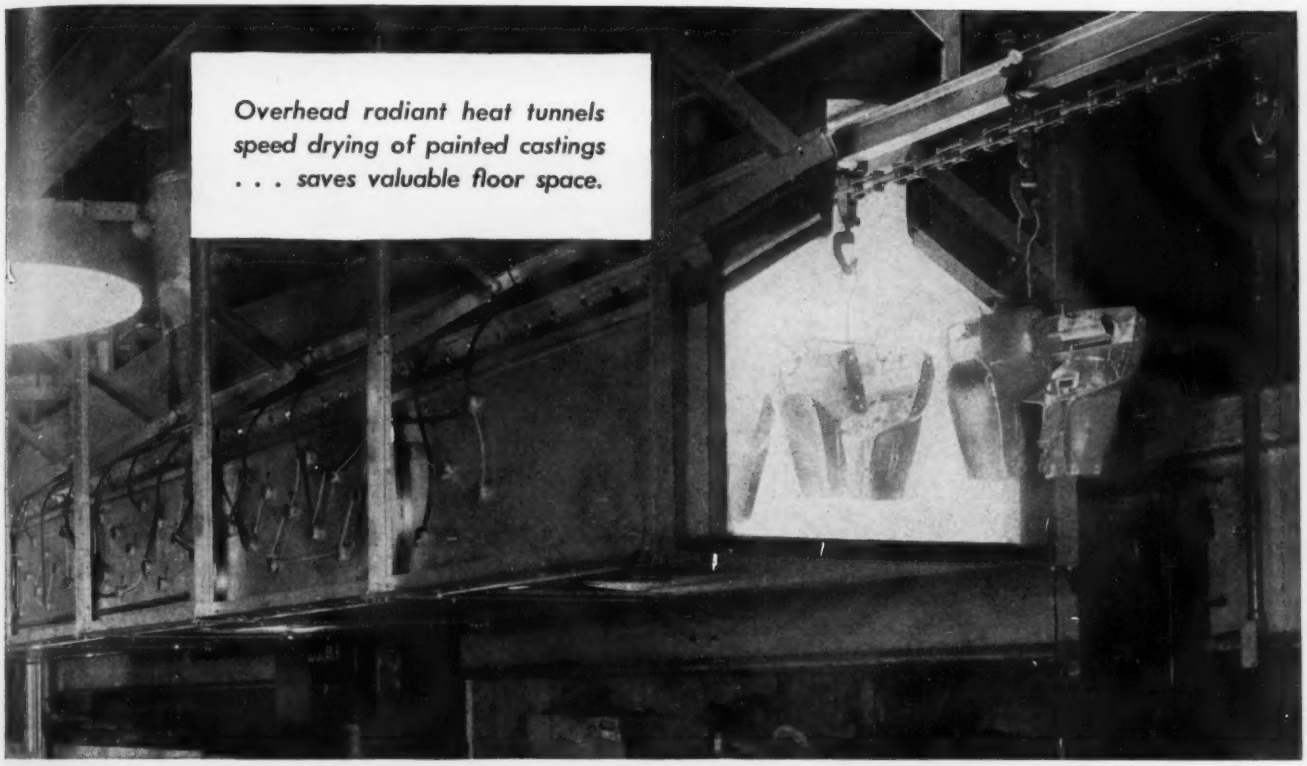
General Electric Co.
Specialty Transformer Division
Fort Wayne, Ind.

Jefferson Electric Co.
Bellwood, Illinois

Sola Electric Co.
2525 Clybourn Avenue
Chicago 14, Illinois

Starring and Company
Bridgeport, Conn.

Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.



Westinghouse Infrared Lamps

Reduce Paint Drying Time 85%

DO THE JOB FASTER, EASIER, CHEAPER

- Baking enamel and lacquer finishes
- Preheating of metals and plastics
- Degreasing
- Mold Drying
- Dehydrating textiles and paper

If you're looking for "bottlenecks" to break, check into your present baking, drying and preheating methods—then get the facts on radiant heat processing with Westinghouse Industrial Infrared Lamps. Look at these advantages:

Fast—Infrared has proved itself for a wide range of industrial purposes as the fastest known means of drying and heating.

Efficient—90 per cent of the energy consumed is turned into heat.

Economical—Small initial investment, inexpensive maintenance, and small space requirements plus high production speed cut manufacturing costs.

Flexible—Wide adaptability for fixed or portable applications simplifies streamlining of whole manufacturing operation.

SEND FOR THIS BOOKLET: To explore the opportunities Infrared Heating offers, write for "Industrial Infrared Lamps" —Form A-3817. This complete guide to modern Infrared heat processing outlines the advantages of radiant heat, lists lamps used, shows typical installations and provides detailed information for specific processes. Address Westinghouse Electric Corp., Lamp Division, Bloomfield, N. J.

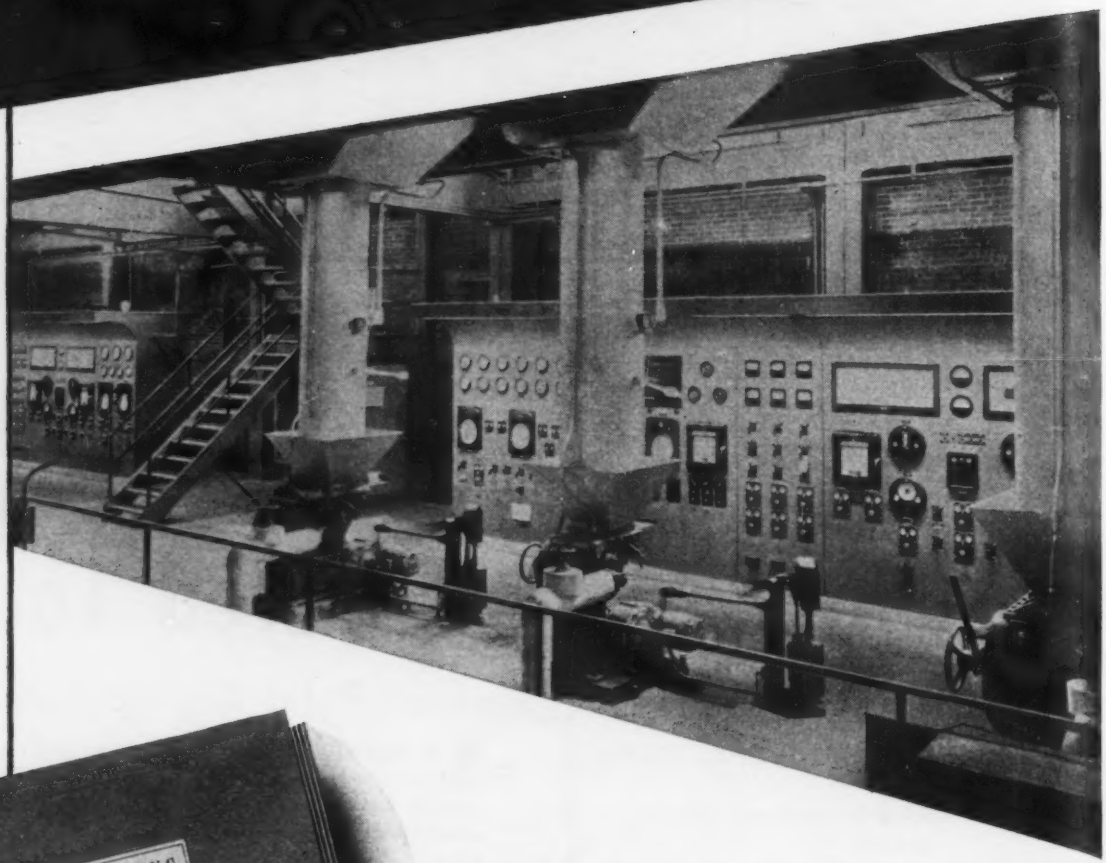
Westinghouse

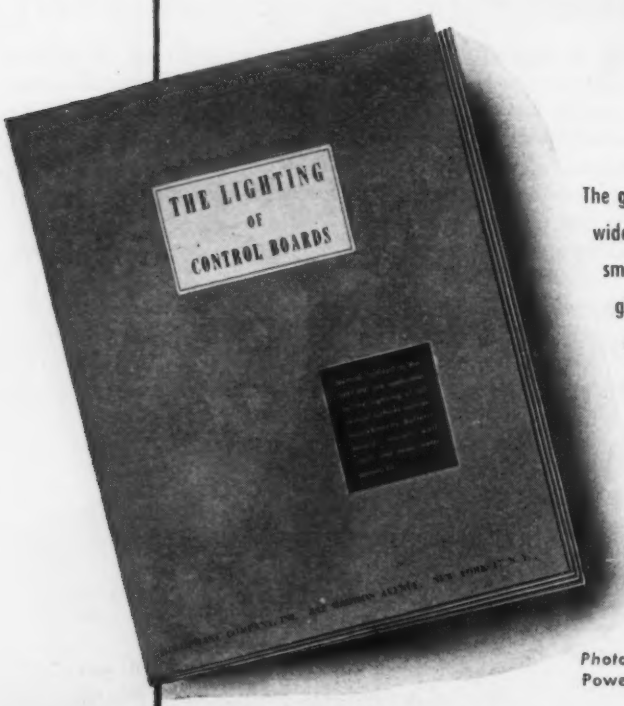
LAMPS FOR EVERY INDUSTRIAL REQUIREMENT

WESTINGHOUSE LAMP DISTRICT OFFICES: 1299 Northside Drive, N.W., ATLANTA; 10 High St., BOSTON; 20 N. Wacker Drive, CHICAGO; 40 Wall St., NEW YORK; 3001 Walnut St., PHILADELPHIA; 32 Blvd. of Allies, PITTSBURGH; 1 Montgomery St., SAN FRANCISCO; 411 N. 7th St., ST. LOUIS.

Holophane
Trade Mark

write for the new Holophane book on CONTROL BOARD LIGHTING





The greatly increased use of control boards, not only in power plants but in a wide range of industry, calls attention to the importance of illumination for smoother, safer operation . . . Specific Holophane Controlens units provide glareless shadow-free lighting of the vertical areas, making it possible for operators to read the meters from any normal viewing position.

Holophane engineers have condensed the experience gained from many successful installations into a new book, "Lighting of Control Boards"... This book treats the basic problems of meter-board illumination; includes practical recommendations and typical calculations for predetermining the exact type of lighting required for each new situation . . . Write for free copy today—no obligation.

Photo above, courtesy Union Electric Co. of Illinois . . . Venice No. 2 Power Plant; Venice, Ill. . . . Engineers: Stone & Webster Engineering Corp.

HOLOPHANE COMPANY, INC.

Lighting Authorities Since 1898 • 342 MADISON AVENUE, NEW YORK 17

THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO

Pacific Coast Representatives:—R. G. Dummel, San Francisco; F. van Gilluwe, Los Angeles
Distributors, General Electric Supply Corp.

what's new in GE street lighting

Mercury lamp life now rated 6000 hours

Life rating of the 400-watt Types B-H1 and F-H1 mercury lamp, in practical use for 12 years, has recently been increased 20%. Users can now expect a full year and a half of service, on the average, from this lamp (6000 hours, on basis of 10 burning hours per start), with no change in rated efficiency throughout life. The price remains the same.

R.M. Swetland, General Electric application engineer for street and highway lighting, examines the mercury-vapor lamp.

With this longer life and the corresponding reduction in servicing costs, mercury street lighting becomes even more economical than before.

FOR BUSINESS STREETS AND HEAVY TRAFFIC ARTERIES

Mercury lighting is ideal for most business streets and heavy traffic arteries. The lamp provides a large volume of light, at high efficiency. The color is distinctive; it helps promote the realization that modern lighting is being used. People like it.

NO SPECIAL LUMINAIRES REQUIRED

The types of luminaires used for incandescent lamps are equally suitable for the mercury lamp—and are normally used on initial installations. This is a definite advantage in your standardization program. These luminaires are attractive in appearance, highly efficient, and free from objectionable glare when equipped with mercury lamps—and of course are highly economical.

GENERAL ELECTRIC

452-44-3010

GOOD STREET LIGHTING BUILDS GOOD WILL—Use of the mercury lamp for street lighting is one of many developments which General Electric has pioneered to help you provide better street lighting at lower cost.

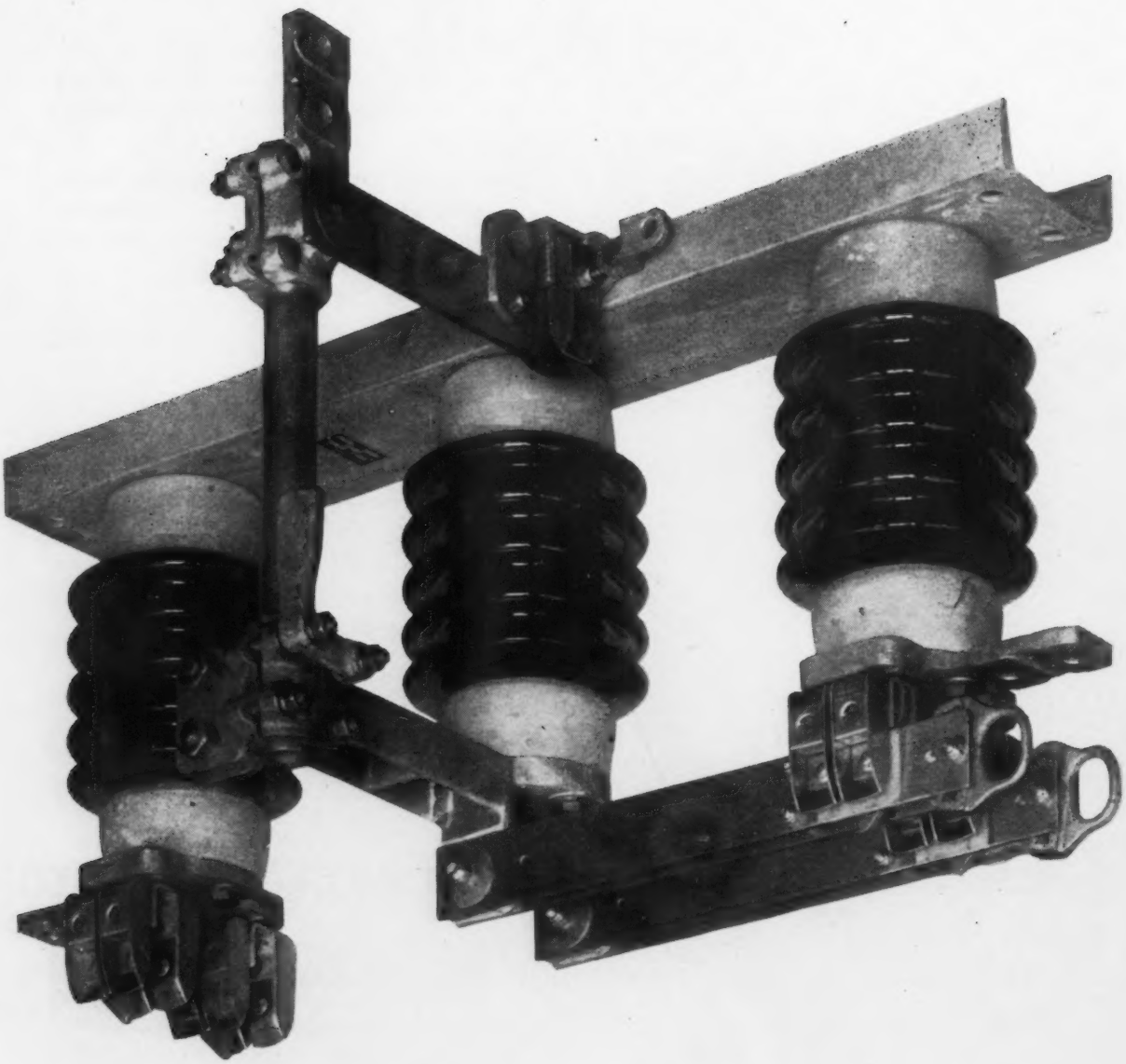
For help in determining where you can use mercury lighting to advantage, call our nearest office or write to *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

Are you tieing in with the NEMA plan to give America better street lighting?

Cole Electric Co.

8439 Steller Drive Culver City, Calif.

AShley 4-3243



OUTDOOR HOOK STICK DISCONNECTING SWITCH
SINGLE POLE TANDEM TRANSFER WITH GROUND SWITCH

15,000 Volts—600 Amperes, Type Y2 Tandem Transfer
For vertical or underhung mounting.

1897 ★ 1947

A Man and an Organization

In 1897, just eighteen years after the birth of the incandescent lamp, Augustus D. Curtis, and his associates, evolved the idea of controlling and directing the light rays of that lamp by means of scientifically designed silver mirror reflectors.

This Curtis "first" was the beginning of a long series of firsts by the company founded by Mr. Curtis.

So thoroughly was the spirit of achievement implanted in this company that now, after a half century of growth, it is gratifying to realize that other firsts marked every milestone.

50

YEARS OF PROGRESS

In the Lighting Industry

1897-1907

1 First to develop a one-piece silvered glass reflector for accurate control of light. (The "X-Ray" Reflector—1897)

2 First to make silvered glass reflector clusters to adapt old gas and electric fixtures for controlled direct lighting.

3 First to incorporate spiral and vertical corrugations in silvered glass reflectors for light diffusing.

4 First to advocate scientific principles in lighting show window displays.

5 First to install a "modern" show window lighting job. (The Washington Shirt Company, Chicago, in 1897)

6 First to use individual silver mirror reflectors for show window lighting.

7 First to export silvered glass reflectors for controlled lighting.

1907-1917

8 First to introduce indirect lighting (Original demonstration made in 1908 before the I. E. S.).

9 First to develop "Adapters" to convert gas and electric stem fixtures to indirect luminaires.

10 First to use portable lamps to provide indirect lighting. (Curtis Adapters)

11 First to emphasize "Eye-Comfort" in lighting applications.

12 First to patent and make indirect luminaires incorporating the luminous bowl principle.

13 First to develop and market a commercial floodlighting projector.

14 First to prepare and distribute "Architectural Plates" on lighting for architects and designers. (1914)

15 First to design church lanterns incorporating concealed reflectors for controlled direct and indirect lighting.

16 First to develop and apply efficient and controlled cove lighting with individual silver mirror indirect reflectors.

17 First to apply silvered reflectors to pedestal for indirect lighting in foyers, lobbies, public dining rooms, etc.

18 First to develop a specially designed silver mirror reflector for indirect wall brackets.

19 First to use individual silvered glass reflectors for stage lighting.

20 First to develop a show case lighting unit with individual silvered glass reflectors (Scoopette)

1917-1927

21 First to advocate "lighting from concealed sources" as a basic fundamental in lighting practice.

22 First to develop and manufacture a comprehensive line of color equipment for show window reflectors. (Color-Ray)

23 First to manufacture a hospital bed lamp for direct and indirect lighting. (Dua-Light)

24 First lighting fixture company to conduct student courses for training illuminating engineers. (Curtis Lighting Training Group)

25 First to develop the show window floodlight. (Flood-Ray)

26 First to develop a hospital night light with control mechanism for dimming. (Nite Light)

27 First to introduce "color lens" cove lighting for theaters, ballrooms, etc. (Culrlenz)

28 First to incorporate colored indirect lighting in large crystal chandeliers.

29 First to use indirect adapters for candle fixtures.

30 First to develop a "control ring" for show window floodlights.

31 First to use high intensity show window lighting to minimize daylight reflections. (Super lighting)

1927-1937

32 First to design and produce Alzak Aluminum lighting equipment.

33 First to provide equipment to concentrate light on the "Attraction-Zone" in window display.

34 First to apply an automatic control "organ" for spectacular color changes. (Lumitone)

35 First lighting equipment company to be licensed under "Alzak" patents.

36 First to patent and manufacture snap-in cover type raceway and a comprehensive line of fittings. (CurtiStrip)

37 First to completely illuminate the exterior surfaces of opaque fixtures by reflected light. ("Edge-Ray")

38 First to manufacture a special library table lighting unit under the Higbee patents.

39 First to make silvered glass reflectors with a patented high temperature heat resisting backing. (The famous Golden Armor)

40 First to make a standard reflector unit for lumiline lamps in continuous lines. (Light-Strip)

41 First with a packaged plug-in show window lighting unit. ("Thrifty-Three")

1937-1947

42 First to introduce continuous lines of light for fluorescent lamps. (Fluorescent CurtiStrip in 1938)

43 First with the patented combination reflector lamp shield principle for horizontal shielding of fluorescent lamps. (SkyLux)

44 First commercial lighting fixture company to conduct and organize a training course for the electrical trade on fluorescent lighting.

45 First to develop an "ejector" type socket for fluorescent lamps.

46 First with an "Engineered" four-lamp fluorescent fixture incorporating glass diffusing panels and louvered direct component lighting. (No. 1240 "Firefly")

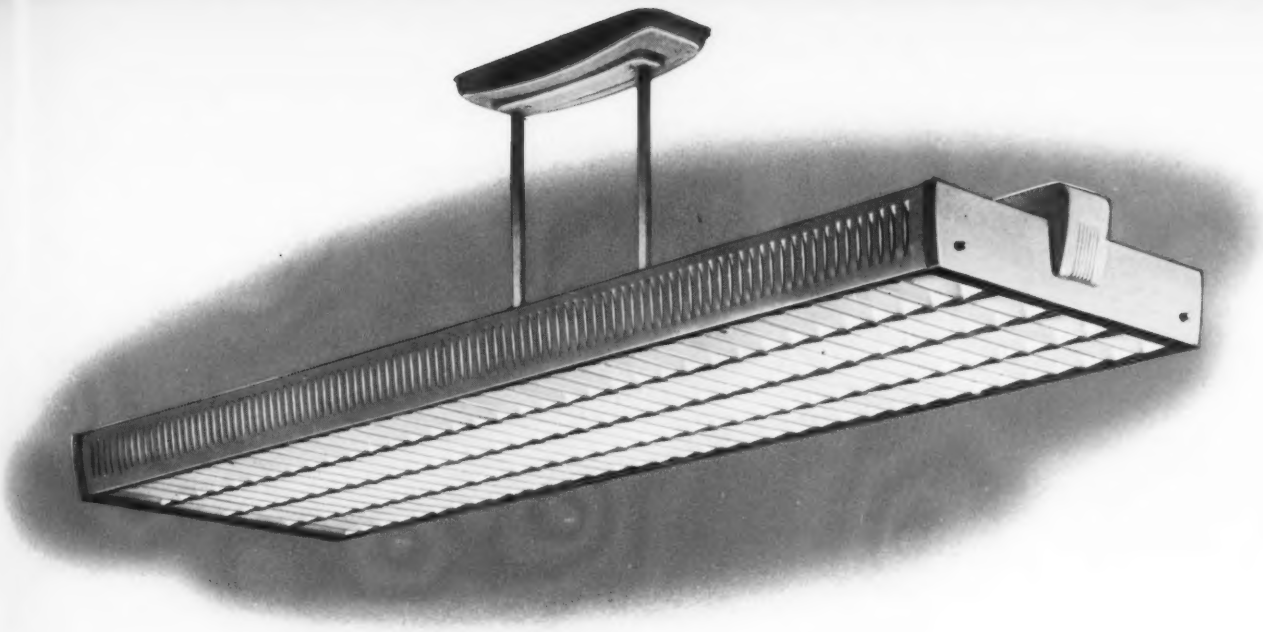
47 First to develop an asymmetric type reflector for the fluorescent lamp.

48 First to patent and manufacture a low brightness glass bowl fixture for scientific downlighting in stores.

49 First to develop and use a stable white synthetic material for reflecting surfaces. (Fluracite)

50 First to design and manufacture a louvered "low brightness" fluorescent luminaire of Alzak aluminum. ("Forty-Sixty")

50 *firsts* FOR FIFTY YEARS



The Anniversary Luminaire

CATALOG No. 51

The new "Anniversary" luminaire is keyed to the spirit of the *next* fifty years. A truly modern design for four 40-watt fluorescent lamps, it incorporates many new features of construction which contribute to its trim elegance.

Catalog No. 51 is a marvel of functional design. The attractive "dart" pattern is integral with the simplified louver construction (which has 30° shielding lengthwise and crosswise). The side panels are ingeniously illuminated by reflected light from the decorative side louvers.

For use as an individual unit or in continuous runs, Catalog No. 51 is completely open at the top and the wide upward distribution permits its application to a great variety of lighting jobs. Its fine balance between simplicity and functional decoration blends well with any type interior.

Your customers will like this unit. Write us today for specifications.

...AND NOW THE

Curtis "51"

FACILITIES TO PRODUCE

ORGANIZATION TO SERVE

★ ★ ★ ★ ★

REPRESENTATIVES

ATLANTA 3, GEORGIA
W. T. Woods, Jr. 231 Healey Building

BALTIMORE 2, MARYLAND
T. H. Bailey, Jr. 614 Garrett Building

BOSTON, MASS.
L. S. Cooke 436 Webster Street
Needham Heights 94, Mass.

CHICAGO SALES OFFICE
600 W. Jackson Blvd. Chicago 6, Illinois

CINCINNATI 8, OHIO
J. W. Morrison 2618 Erie Avenue

CLEVELAND 15, OHIO
J. W. Shively Swetland Bldg. Room 402

DALLAS 1, TEXAS
Fred H. Simmer 103 Thomas Bldg.

DENVER 2, COLORADO
H. M. Olmstead 1534 Wazee Street

DETROIT 26, MICHIGAN
C. H. Burch 424 Book Building

INDIANAPOLIS 4, INDIANA
H. J. Damm 20 South Capitol

KANSAS CITY 3, KANSAS
H. B. Ewert 5228 Canterbury Road

MILWAUKEE 2, WISCONSIN
H. Q. Beven, 759 N. Milwaukee St., Rm. 204

MINNEAPOLIS 2, MINNESOTA
G. M. Felland 220 So. 10th Street

NEW ORLEANS 18, LOUISIANA
Hutson Colcock 3 Bamboo Road

NEW YORK SALES OFFICE
New York 17, New York
230 Park Avenue New York Central Bldg.

PHILADELPHIA, PENNSYLVANIA
F. M. Pyle 836 Eaton Road
Drexel Hill, Pennsylvania

PITTSBURGH 22, PENNSYLVANIA
R. F. Clark Clark Building Room 1404

ROCHESTER 7, NEW YORK
Ray A. Siedle 662 Monroe Ave.

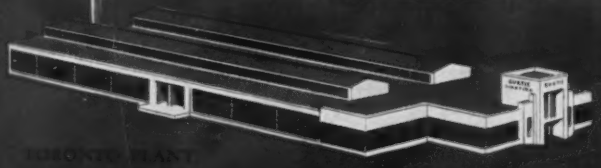
ST. LOUIS 1, MISSOURI
G. C. Law 313 N. 9th Street

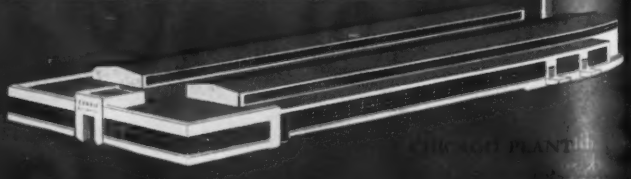
SAN FRANCISCO 2, CALIFORNIA
J. D. Erikson 100 Hermann Street

SEATTLE 1, WASHINGTON
W. K. Turner Terminal Sales Building

CURTIS LIGHTING OF CANADA, LTD.
Leaside, Toronto 12, Ontario, Canada
195 Wicksteed Avenue

CURTIS LIGHTING, INC.
6135 W. 65th St., Chicago 38, Ill.





Curtis Lighting

NEW YORK ★ CHICAGO ★ TORONTO

SALES & SERVICE REPRESENTATIVES IN ALL PRINCIPAL CITIES

LETTERS TO THE EDITOR

To the Editor:

May I express my appreciation for your heart-warming editorial on the passing of Clark Baker. It is too often true that a pioneer is never fully appreciated by his contemporaries.

Clark Baker's greatest achievements were intangible—the building of an appreciation of the value of light among the tens of thousands to whom he brought his message. No one who ever saw and heard Clark's dramatizations will forget the fundamentals. The results of his work are to be seen everywhere about us—in the acceptance of the highest standards of lighting here in northern California. The California Recommended School Lighting Practice for which he was largely responsible is now serving as a model for the new National IES School Lighting Practice—the influence of Clark Baker's work is being felt far from the Bay area which he loved.

Clark has done so much for all of us, in the electrical industry, it seems only fitting that we in turn should carry on to completion the project nearest his heart—preserving the vision of school children. May I suggest that the electrical industry consider a three-year fellowship in his name at Stanford University Illumination Laboratory. There is urgent need for factual information on brightness control and the application of new light sources, if the great work Clark Baker began here in northern California is to continue. There is no finer tribute we could pay than to carry on his leadership through a Clark Baker Memorial Fellowship in School Lighting.

R. E. Fisher,
Vice-President in charge
of Public Relations and Sales,
Pacific Gas and Electric Co.
San Francisco

Editor's Note: Knowing Clark Baker's work so well, Electrical West echoes Earl Fisher's suggestion and urges the directors of PCEA to act on behalf of the entire industry in initiating such a fellowship. It is appropriate that it be at Stanford too, for it was with Dr. Leland Brown there that Clark Baker worked in the development of school lighting recommended practices.

To the Editor:

Please accept this expression of my appreciation and my thanks for the excellent report of my work you published in issue No. 1, Volume 98 of your periodical.

I think I can say without possibility of contradiction that this article is the simplest and best statement of the ideas and data in the paper "Light for Living" that has so far been made. We are sending a copy to all of our engineers in this country and to some of our engineers in Canada and England.

H. L. Logan
Manager
Dept. of Applied Research
Holophane Co., Inc.
New York

KLEINS
...FOR THE
MAN ON THE POLE

On emergency jobs . . . on tough jobs . . . on routine jobs . . . the men who string and maintain the nation's power and communication lines rely on Kleins. Wherever you see linemen you'll see Kleins—pliers and wrenches, tool belts and safety straps, climbers and grips.

There's a sound reason for this preference. For linemen and electricians—men who know good tools—also know of the quality materials and expert craftsmanship that go into every piece of Klein equipment. To them this excellence means safety, efficiency, speed . . . on every job.

Today Klein is in production on its complete line of quality equipment. Of course, demand still exceeds supply—but your supplier will furnish the Klein equipment you need just as soon as possible.

Klein Pliers

Klein-Kord Tool Belts

Klein-Kord Safety Straps

Klein Climbers

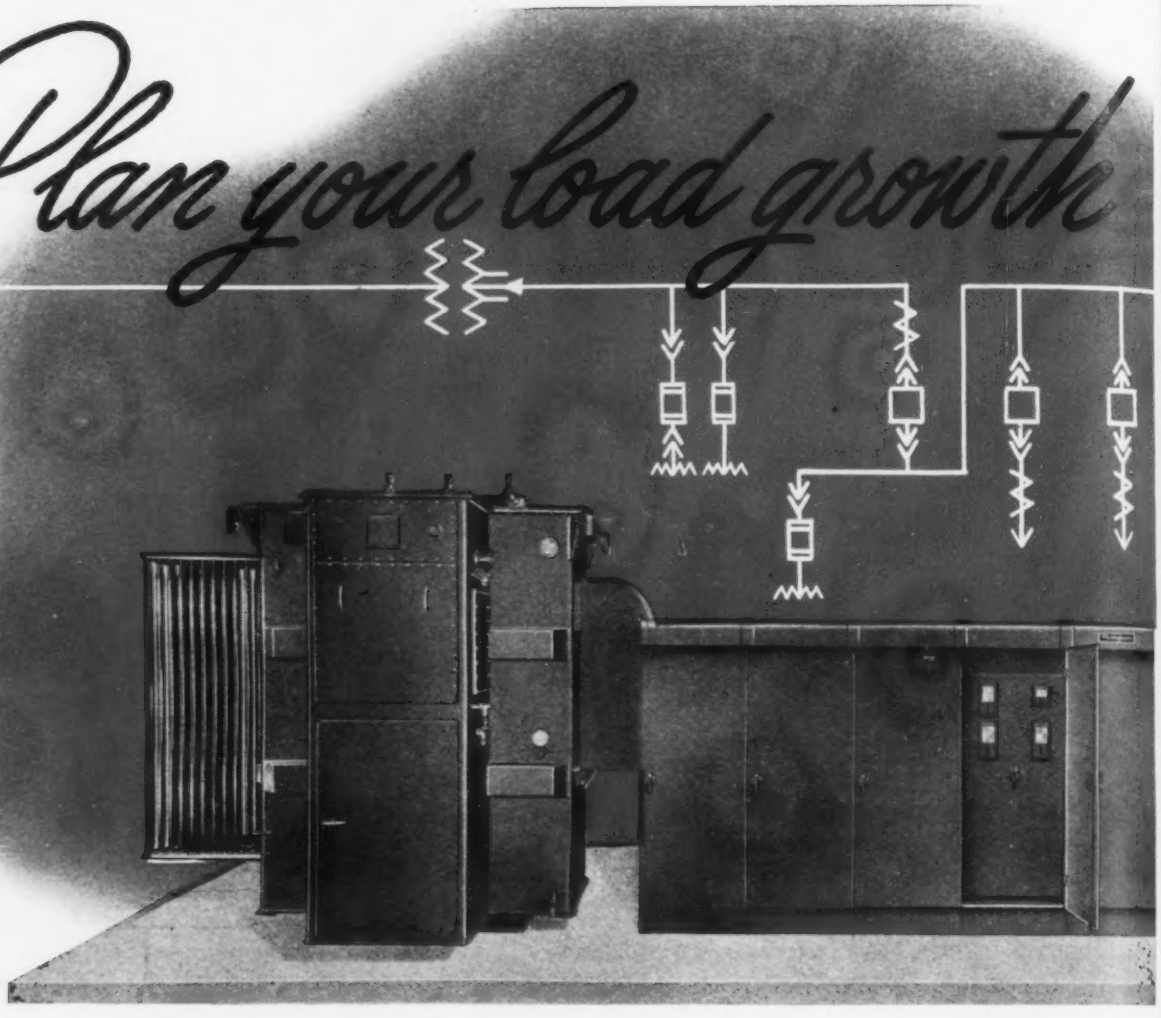
ASK YOUR SUPPLIER
Foreign Distributor:
International Standard Electric Corp.,
New York

The Klein Pocket Tool Guide showing the Klein line and containing useful information will be sent on request.

Since 1857

Mathias KLEIN & Sons
Established 1857
Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

Plan your load growth



WESTINGHOUSE CAN SUPPLY UNIT SUBSTATIONS AND RELATED EQUIPMENT FOR ANY SYSTEM REQUIREMENT

Westinghouse Unit Substations not only meet today's demands . . . they provide the necessary *flexibility* for future changes in load requirements.

Due to their compactness and "Unitized" type of construction, they can be moved easily to new locations that may be required by any change in the center of the load . . . with 100% salvage value. Further new substation units can be added to accommodate any load growth. Built-in tap changing under load is provided. Because of their flexibility and adaptability, they are applicable to either the radial or network distribution systems.

The double-ended Unit Substation (above) assures greatly improved service continuity. It provides a power supply from two sources. An outage at one source will not interrupt service.

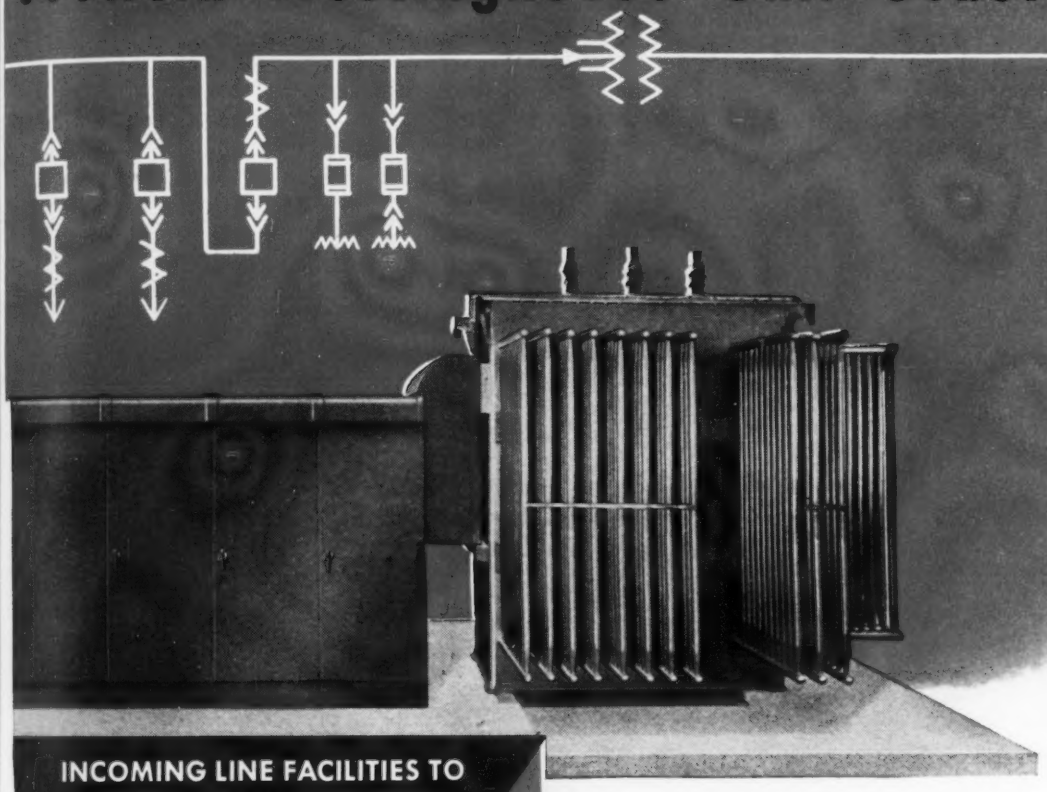
It will pay you to investigate the advantages of self-contained, self-protected Westinghouse Unit Substations. Call your nearest Westinghouse office or write for B-3238, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-97124

WESTINGHOUSE

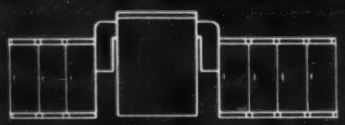
Westinghouse UNIT SUBSTATIONS FOR ANY SYSTEM

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

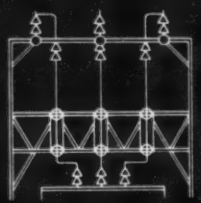
...with Westinghouse Unit Substations



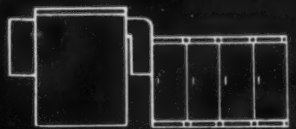
INCOMING LINE FACILITIES TO MEET EVERY REQUIREMENT...



—When required Unit Substations can be supplied with coordinated, metal clad, "Unitized" switchgear for incoming power supplies of 13,800 volts and below.



—Prefabricated overhead incoming line structures.

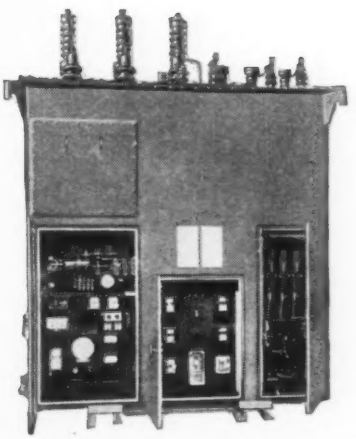


—Transformer mounted terminal chambers or switches for use with underground cables.

ADD UP THESE *Advantages*

YOUR ANSWERS TO BETTER DISTRIBUTION PLANNING.

1. **Modern and Pleasing in Appearance.**
2. **Compact—saves space.**
3. **Minimum Installation Time and Cost.**
4. **Improved Service Continuity.**
5. **Low-Cost Maintenance**—operating parts easily accessible.
6. **Undivided Responsibility**—all equipment supplied by one manufacturer.
7. **Full Co-ordination**—electrically and mechanically.
8. **High Salvage Value**—entire substation can be easily moved.

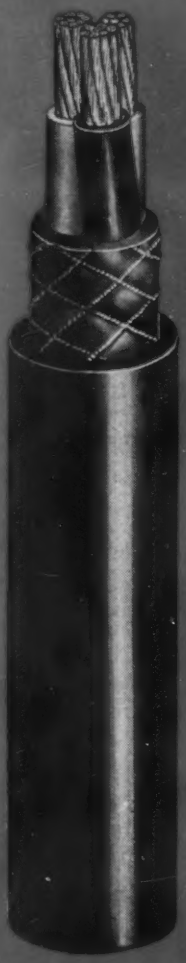


FOR SINGLE-FEEDER SUBSTATIONS

● . . . the last word in "Packaged Power"—The Westinghouse CSP Power Transformer combines compactness, "eye-appeal", and performs all the functions of a conventional substation; transformation, voltage regulation, metering and protection.

Highest Quality!

CRESCENT
IMPERIAL NEOPRENE
CRESCORD



For Heavy Duty
Industrial Use

The tough NEOPRENE Jacket gives this cable maximum life under the most severe operating conditions. Among its advantages, it is

OIL PROOF
SUN PROOF
ABRASION RESISTING
FLAME RETARDING
FLEXIBLE
LONG LIVED

Furnished in all sizes from No. 18-Two Conductor to 500,000 C.M. Three Conductor.

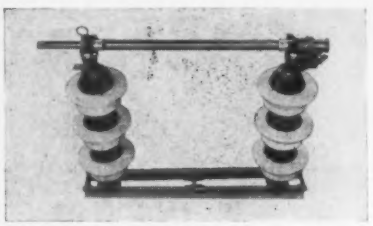
CRESCENT
WIRE and CABLE

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

PRODUCT NEWS

Drop-Out Fuse (500)

A new drop-out type fuse for application on circuits operating at voltages up to 138 kv. has been announced by S & C Electric Co. (formerly Schweitzer & Conrad). Known as the "SMD", the fuse was designed with an eye to the need for protective equipment on the primary side of power and potential transformers connected to transmission lines. It incorporates new features intended to provide "full coverage" protection, the company states. Design of the dielectric structure of the fuse tube is coordinated with the dielectric strength of the interrupting bore and with the protected insulation level of the system, preventing flashover, and is claimed by the manufacturer to have ample mechanical strength to withstand the pressure developed during interruption of large short circuit currents. The drop-out feature incorporates a latch that is self-adjusting when closing and closed; is said to give quick release under all weather and atmosphere conditions.



Oil Blast Breaker (501)

Completely sealed bushings, simplified lightweight multibreak interrupter, pneumatic operating system, reduced tank diameter, are features of G-E's new high-voltage oil blast breaker. Designated FK-439, the unit has voltage ratings at 115 to 230 kv., with interrupting ratings of 2,500 mva. at 115 kv. and 3,500 mva. at 138 to 230 volts. Bushings are of the new Type F design, which creates space for two current transformers on each bushing and permits a total of 12 transformers per breaker. Multibreak interrupter type contacts are basically the same for all ratings, although at 230 kv. an additional pair of breaks is used, making a total of six per interrupter at this voltage.

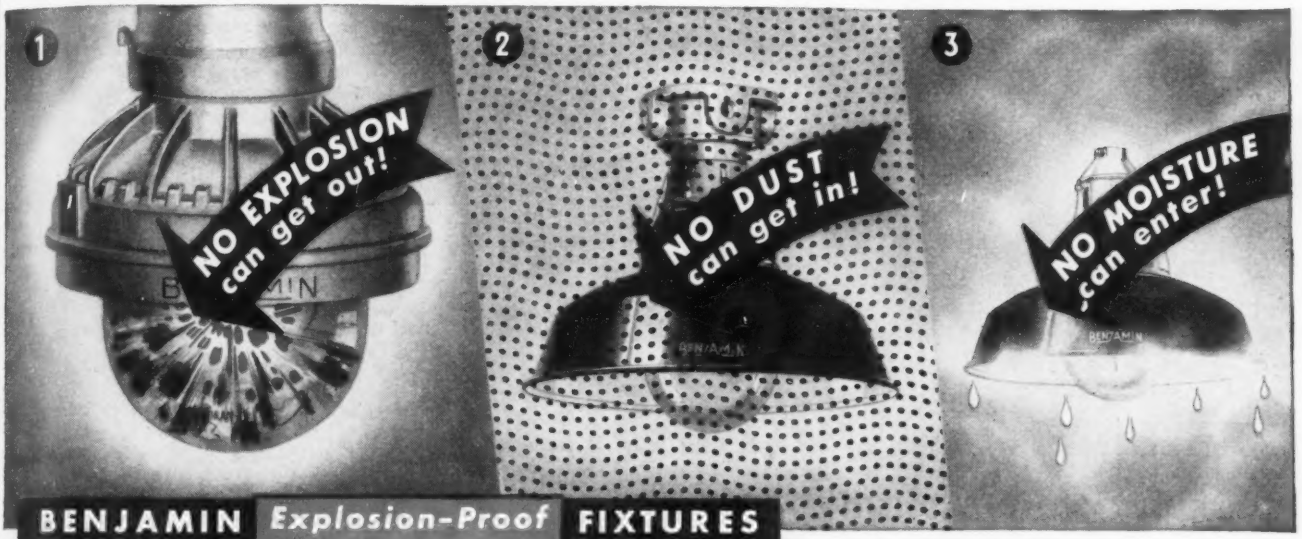
Cut-Out Switch (502)

Brown Division of Minneapolis-Honeywell Regulator Co. has developed a recorder cut-out switch which it states is especially adaptable to the petroleum and chemical industries. It consists of a double-pole, double-throw mechanically operated push-button switch for multipoint indicators.

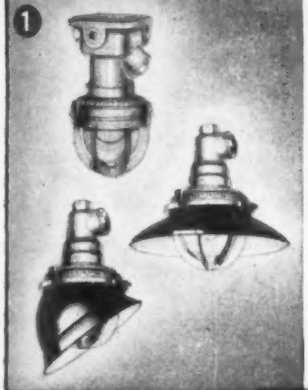
Exposure Meter Hood (503)

A new hood with A.S.A. exposure index numbers for all Type DW-48 or DW-58 exposure meters is offered by G-E. This new hood will bring up to date in relation to A.S.A. film rating numbers G-E exposure meters manufactured since 1940. Old model meters need not be altered for use with the new hoods, the manufacturer states

Important Facts you should Know about Benjamin *Explosion-Proof, Dust-Tight* and *Vapor-Tight* Lighting Equipment



BENJAMIN *Explosion-Proof* FIXTURES

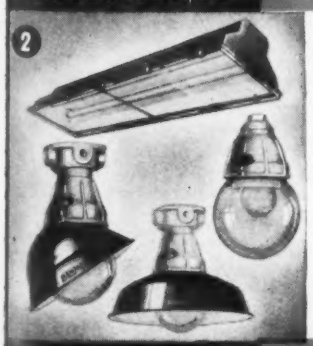


Constructed to:
Confine Explosions Within Fixture.

These units meet the severe spark plug test in which spark plugs are used to create ignition of explosive mixtures within the fixture 30 or more times. Tested also to withstand hydrostatic pressures ranging to 380 lbs. per sq. in. For Class C (Ethyl-Ether atmospheres) a series of 50 additional explosion tests are met. Benjamin units are neither destroyed nor damaged by such tests nor do they permit the passage of flames or dangerously hot gases to escape to the surrounding atmosphere. Further, they pass all tests for operation at safe temperatures below the ignition temperature of the explosive atmosphere.

Uses: Listed by Underwriters' Laboratories for Class I, Group C and D hazardous locations, which include locations where flammable volatile liquids, highly flammable gases, mixtures or other highly flammable substances are used, handled or stored in other than their original containers.

BENJAMIN *Dust-Tight* FIXTURES

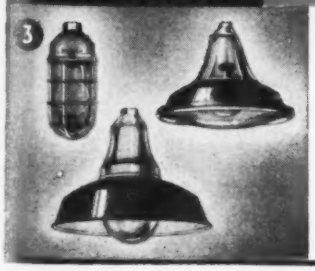


Constructed to:
Prevent Penetration of Explosive Dust to Lamp and Operate at Safe Temperatures.

Tests passed by these Benjamin fixtures include: Dust-Tight Test, 6 cycles of on and off operation at maximum room temperatures in a whirlwind of explosive dust-air atmospheres; Temperature Test, safe operation of fixture when covered with a heavy blanket of ignitable dust; a 35-hour, 2000 r.p.m. Vibration Test.

Uses: Listed by Underwriters' Laboratories for Class II, Groups E, F, G, and Classes III and IV hazardous locations. Includes such locations where the air may become laden with combustible dusts or where easily ignitable fibers are present. Also where dusts may settle upon ordinary fixtures in excessive quantities.

BENJAMIN *Vapor-Tight* FIXTURES



Constructed for:
Use in Locations where Fixture is Exposed to Moisture or Non-Combustible Dust.

These fixtures are highly resistant to penetration of moisture and non-flammable dusts, gases, or vapors. They meet Benjamin's high standards for performance and their dependability is attested to by their years of service throughout industry.

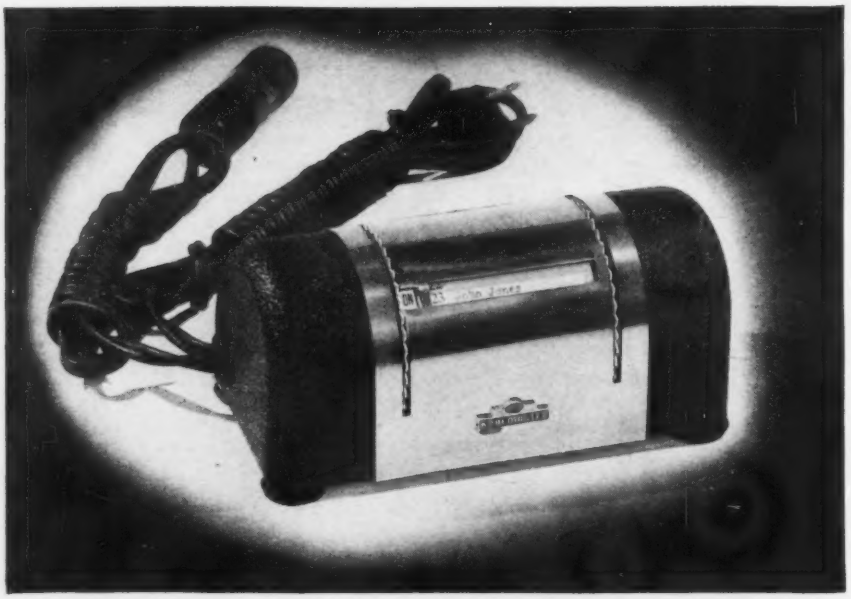
Uses: Listed under Re-examination Service of Underwriters' Laboratories as Inspected Vapor-Tight Fixtures. Includes locations where non-flammable gases or vapors are present or where non-combustible dusts exist.

Severe Tests and Years of Service demonstrate Dependability of these Special Benjamin Fixtures

Illustrated here are the three groups of Benjamin fixtures for use in hazardous locations. Fixtures in each group must pass stringent tests for conditions far beyond those found in actual service. Some of these tests are given in the chart at left, together with typical applications for each group.

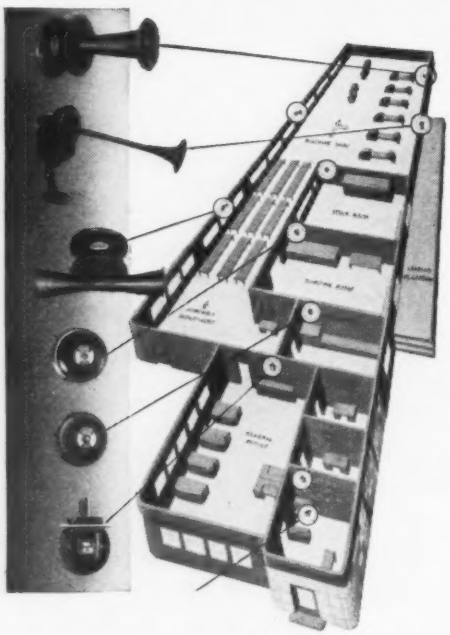
Benjamin's years of experience in the manufacture and installation of such fixtures give assurance of maximum protection against fires, explosions and lighting interruptions due to hazardous or other abnormal atmospheric conditions. In the solution of special lighting problems involving the use of such equipment, Benjamin's experience and engineering recommendations are available without cost or obligation. Write for Free Data Bulletins containing detailed information concerning all of Benjamin Hazardous Location Lighting Equipment bearing the label of the Underwriters' Laboratories. Address Benjamin Electric Mfg. Co., Dept. J, Des Plaines, Illinois.

BENJAMIN
TRADE MARK
HAZARDOUS LOCATION
Lighting Equipment
DISTRIBUTED EXCLUSIVELY
THROUGH ELECTRICAL WHOLESALERS



FARADAY KODEMASTER

Gets the right man in a jiffy!



A long distance call—an important conference—can't wait for the operator to telephone all around the plant. Time is valuable—too expensive to waste! Kodemaster will get the right man in a jiffy—only a few seconds and its message reaches every nook and corner of the plant and the man is located.

Every factory large enough for a telephone switchboard needs the efficient Faraday Kodemaster. It's the ideal system for locating individuals in a hurry—up to 30 different code signals.

Kodemaster is a unique, compact, fool-proof control for *old* or *new* signal systems. May be set up with any number or combination of bells, buzzers, horns, Kodaires, chimes, sirens.

For profits now and customer satisfaction that will lead to more business later, recommend and install Faraday Kodemaster.

FARADAY UNIPACT units are interchangeable, "as easy as plugging in a toaster."

FARADAY
ELECTRIC CORPORATION
Adrian, Michigan

Load Visualizer (504)

G-E has announced the new AF-1 a-c load visualizer, a lightweight, low-cost analyzer for single-phase and balanced polyphase systems. Besides serving as a standard 0-2.5/5-amp. ammeter and a 0-150/300/600-volt voltmeter, this instrument may be used with the calculator furnished to determine watts, vars, volt-amperes and power factor for load surveys, induction motor tests, reactive-power studies and power-factor checks on power and lighting circuits. It has an ironvane moving element and separate field winding for voltage and current. The current winding is electrically insulated from the imposed voltage by an internal double-current transformer. The current and voltage terminals are energized simultaneously from the line or through instrument transformers to extend the range. Operation is controlled by three selector knobs, placed at the end opposite the connection terminals.

Program Clocks (505)

An improved line of synchronous program clocks has been announced by Montgomery Mfg. Co. The signal switching system will carry 1,000 watts and once set, the clocks continue to follow an exact schedule until reset, the manufacturer states. All models have standard 12-hour full-vision dials and program discs that rotate in either 12 or 24 hours; mechanism can be set to close an electrical circuit at any desired 2½-min. interval in the 12-hour disc or 5-min. interval in the 24-hour disc; as many as 288 operations per revolution of the disc are possible. Six models are available to handle one, two or four program circuits of 12- or 24-hour cycles with automatic calendar silencing as desired. A toggle switch cuts out the automatic mechanism and a push button permits manual operation of signals. Standard models operate on 115 volts, 60 cycles; other voltages and frequencies are available on special order.

Snap-Action Switch (506)

Micro Switch is offering a small, unhoused, skeleton type precision snap-action switch claimed to be specially adapted to actuation by rotating or sliding cams. The "SK" type is a single switch unit, available in NO, NC, or DT circuit arrangement. Switch elements is 1-3/16 in. long, is mounted on a laminated phenolic base. The manufacturer states that, where control of several circuits requires multiple control by cams, slides or push buttons, "SK" switches can be ganged or compactly mounted on a common base on centers as close as 7/16 in.

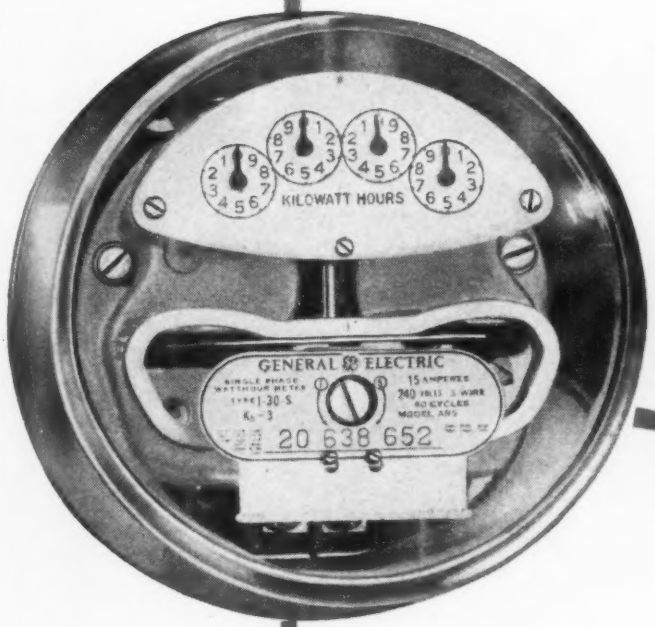
Small Motor (507)

L. & R. Mfg. Co. is building a general-purpose universal motor rated 1/10 hp. at 5,000 r.p.m., a-c and d-c. It has a spindle with ⅜-in. shaft extending in both directions and double-shielded ball-bearings. Outside diameter is 3¼-in. The motor is mounted on a pedestal and is supplied with 3-step pulley, foot rheostat and reversing switch.

Mercury Switch (508)

A new mercury switch less than 1½-in. long and rated at 1 amp. for 115 volts a-c is available from Minneapolis-Honeywell. It is actuated by a snap tilt of 12°, using a SPST action; is identified as No. AS-408D.

You can count on the

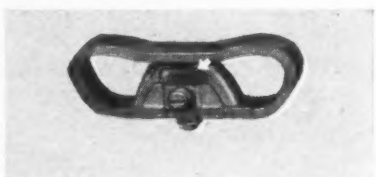


I-30

FOR COMPLETE TEMPERATURE COMPENSATION

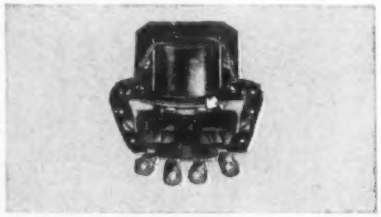
CLASS I

Temperature-compensating shunt which gives uniform compensation for Class I temperature errors at all loads.



CLASS II

Temperature compensation for Class II temperature errors is incorporated in the light-load and lag adjustment.



Today the trend of metering practice is toward outdoor installations, where meters are exposed to much wider variations of temperature. Hence, the accuracy of the modern watthour meter must be unaffected by extreme temperature changes. Here again the Type I-30 watthour meter sets the standard, for it offers more nearly perfect compensation of temperature errors . . . errors affecting the magnetic damping (Class I), and those affecting phase angle (Class II).

The true measure of a meter's design quality lies in the amount of compensation required. A perfect meter would need none. Since the I-30 nearly approaches design perfection in this respect, it requires the minimum of compensation. This is especially true of Class II errors. Its low-resistance, high-reactance potential element minimizes the need for temperature compensation and results in more uniform, as well as more accurate, performance characteristics.

For complete temperature compensation, for complete reliability, include the I-30 wide-limit meter in your program. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

Headquarters for Electrical Measurement

GENERAL ELECTRIC

601-17-6110

Anhydroprene

HAS NO BRAIDS TO ROT!

ANHYDROPRENE wires and cables are made with a thin wall of neoprene instead of a fibrous braid. There is no braid to rot or to "freeze" to the wall of a duct. The thin neoprene jacket resists oils and solvents as well as acids, alkalies and corrosive chemicals.

Anhydroprene wires can be installed overhead in messenger rings. They can be racked on the wall or they can be installed in conduits or raceways. Underground they can be used in ducts.

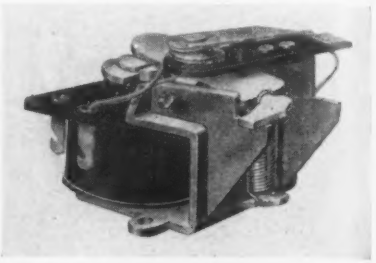
Simplex Data Sheet #115 has complete information on this type of wire. Write for it today.

Simplex-WIRES & CABLES

SIMPLEX WIRE & CABLE CO. 79 SIDNEY ST. CAMBRIDGE 39, MASS.

Relay (509)

The new Ward Leonard Bulletin 109 relay is designed specifically for use with single-phase a-c capacitor motors for oil burners, refrigerators, floor polishers, etc. External or remote mounting is permissible. This relay is essentially a potential device operating over a wide range of voltages as distinguished from the close-differential current type relay, and has a unique magnetic circuit designed to achieve chatterless operation down to the drop-out point. Contacts are SPNC suitable for up to 1 hp., 115 or 230 volts, 60 cycles. Approximate size is 1½ in. high, 1¾ in. wide, 1 15/16 in. long.

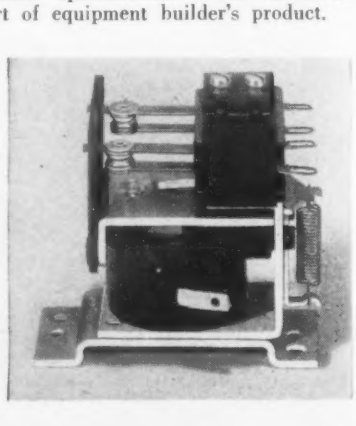


Traffic Control Relay (510)

Eastern Industries Inc., Automatic Signal Division, is marketing an a-c relay for vehicle-actuated traffic control systems, which it claims stands up under 10,000,000 operations per year. A circuit closure of .010 seconds operates the relay cleanly, according to the manufacturer, and as many as ten individual pairs of contacts can be accommodated on each relay. Each contact spring is encased in phenolic insulation. Coils for 115 and 12 volts, 60 cycles, and silver contacts 5/32 in. diameter (rated 5 amp., 115 volts a-c non-inductive) and 7/32 in diameter (rated 10 amp., 115 volts a-c, non-inductive) are standard. Other contacts and coils can be supplied on special order. Any combination of normally open, normally closed, break-made, make-before-break, or break-make-before-break can be assembled in any relay, it is stated.

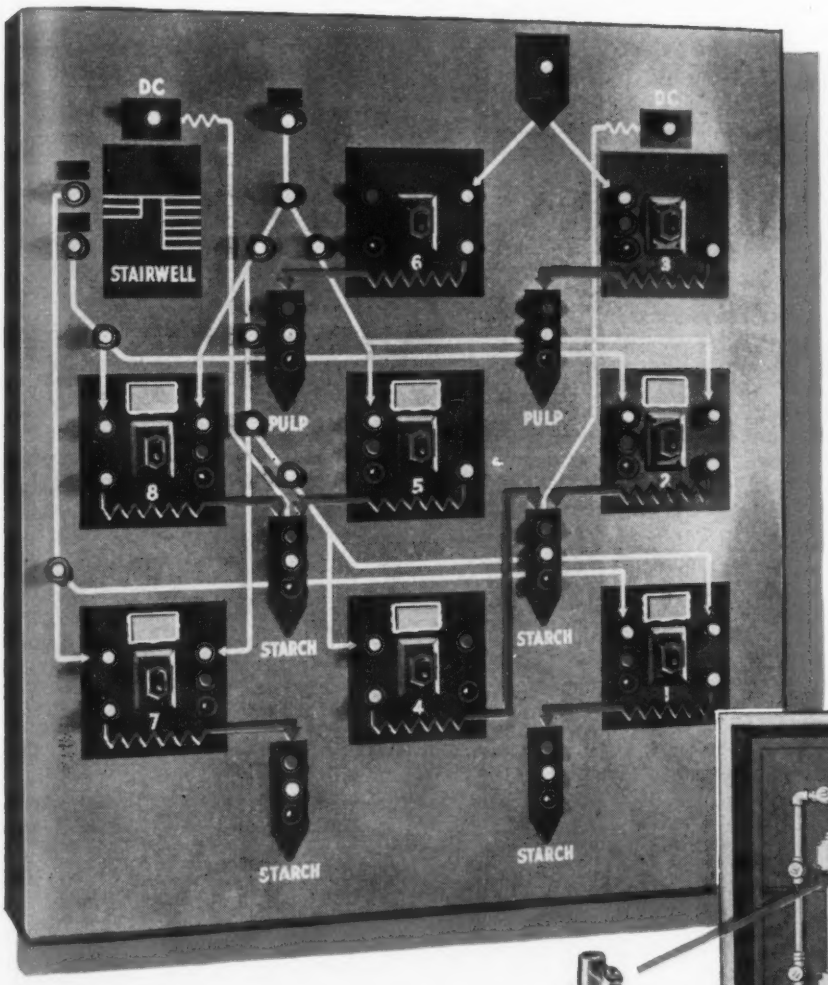
Magnetic Relays (511)

R-B-M Division of Essex Wire Corp. has a new line of a-c and d-c magnetic relays for general-purpose application. The relay shown is DPDT intended for Class C small electrical devices. DPNC is also available. The line also includes 3-amp. contacts up to 6-pole double throw for low-voltage application, as well as relays rated at 12 amp., 115 volts, a-c which are designed to Underwriters' specifications when submitted as part of equipment builder's product.



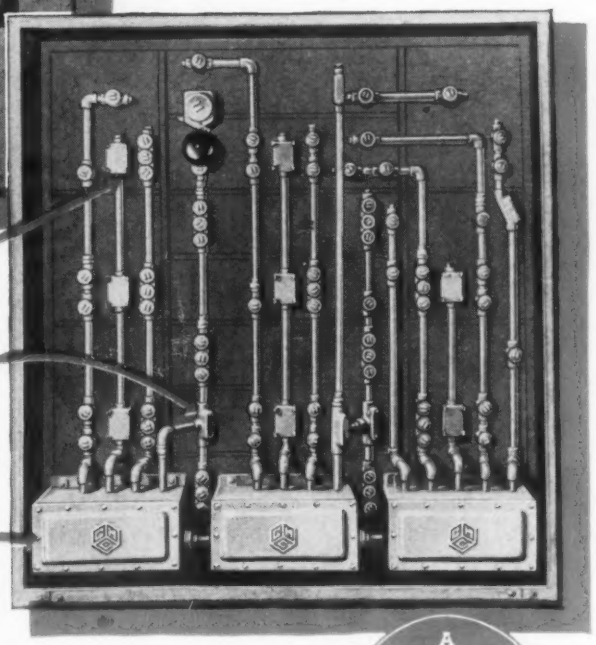
Central flow-line boards for the control of modern industrial processes

are easy to design with CROUSE-HINDS complete line of panel mounting *CONDULET equipment for hazardous locations



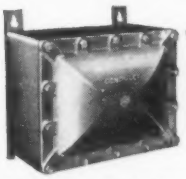
Crouse-Hinds panel mounting pilot lights and switches provide visual indication of process stages and instant control of processing or manufacturing equipment. The illustrations show front and back views of a flow-line control board in a starch plant where combustible dust creates a Class II (National Electrical Code) hazardous location.

*CONDULETS are made only by CROUSE-HINDS



Type EYS Explosion-Proof Sealing Condulet

Type GUAT Explosion-Proof Junction Condulet



Type EJB Explosion-Proof Junction Condulet

The pilot lights and switches are dust-tight and explosion-proof and are designed for both Class I and Class II hazardous locations. A similar control board for use where flammable gases or vapors create a Class I hazardous location would only require substitution of explosion-proof junction Condulets and the addition of explosion-proof sealing Condulets, as indicated.

Write for additional information.

A Nationwide Distribution Through Electrical Wholesalers

Our 50th Anniversary 1897 – 1947

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City — Los Angeles — Milwaukee — Minneapolis New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle — St. Louis — Washington. *Resident Representatives:* Albany — Atlanta — Charlotte — New Orleans
CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

TOPS THEM ALL

FS-40
Automatic
STARTER

Pat. Nos.
2200443
2228210

Other Pats. Pend.

FEATURES

- **Locks Out . . Resets Automatically.**
- **Most effective starter yet produced.**
- **Gives long life to ballast because defective lamp is locked out. Prevents overheating.**
- **The life of the AUTOMATIC starter is many times greater than that of average lamp.**
- **It saves maintenance costs and power consumption. Protects and insures longer life to ballast and lamp.**
- **Millions in use — Repeat orders prove trade acceptance.**

No. 651
FLEX-LOC
Lamp Holder
PATENTED

FEATURES

- **FLEXIBLE — Self-adjusting to variations in length of lamps. The ONLY lamp holder that flexes.**
- **AUTOMATIC LOCK—Lamps positively cannot fall out. Electrical contacts grip both sides of lamp pins.**
- **SIMPLE STREAMLINED DESIGN — No turning or twisting of lamps necessary.**
- **NO NEED TO CHANGE fixture layout. Engineered to fit all standard fixture spacings.**

Lloyd
PRODUCTS COMPANY
Providence 5, R. I.
Branch Offices and Warehouse Stocks in 27 Leading Cities

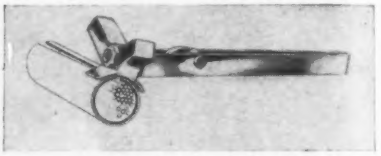
LLOYD POLICY INSURES QUALITY

Neon Sign Cable (512)

A neon sign cable incorporating Polyethylene insulation and a Flamenol jacket has been added to the G-E line. The new cable is smaller and lighter than prewar types; has an over-all diameter of 0.254 in. and is 26 mils smaller than the old 5,000-volt cable. The insulation has dielectric strength of 1,000 to 1,100 volts per mil at 25° C; electrical losses are low; power factor is 0.0003, dielectric constant, 2.3 at 25° C. This cable replaces Types GTO-5, GTO-10 and GTO-15; has been designated Polyethylene-Flamenol GTO-15 by Underwriters' Laboratories and is listed for use between high-voltage terminals of sign transformers and signs. It has been approved also for use as oil burner ignition cable.

Slitting Tool (513)

A tool claimed to slit the lead sheath of any cable in general use without danger of cutting into the thin liner is offered by Buckingham Mfg. Co. An adjustable slitting blade, guided by a radial guard, is held securely in place by an Allen set screw which is loosened to make adjustments in cutting depth, or to reverse the blade. The



reversible feature permits right- or left-hand usage. The tool cuts along the length of the lead sheath by means of hammer blows applied to either forged lug of the double head or in the direction of the bit's cutting edge. A spreading dog is built into the tool handle and has two anchor holes for adjusting it to varying cable diameters. Spare blade and wrench are supplied.

Snake Leader (514)

The N. E. Bend snake leader is designed to steer the fish tape smoothly around any bend in the conduit and is claimed to go through more 90° bends than the code permits; to be capable of pulling more than 750 lb.; to handle more than seven No. 14 wires or five No. 12 wires at one time. It is being distributed to electrical wholesale houses by Burbank Distributors.

Shielding Tape (515)

Keller-Dorian Corp. reports that it is producing a metalized paper shielding tape for use in oil-impregnated paper insulated cables The manufacturer claims that cables shielded with this tape are protected from moisture diffusion in factory or field exposure, have higher dielectric strength, slower aging on cyclic loading, and improved power factor stability.

Template (516)

Rapidesign Inc. is offering the Electro-Master No. 175, a template for electric circuit symbols. This device is a 45° triangle made from mathematical-quality plastic sheets, laminated to .080 thickness. Inner contours are beveled. Printing is between laminated sheets to prevent its wearing off. List price, $4.

GAIN ON YOUR "BACKLOG" WITH FWD TRUCKS

FWD Model HA Utility Truck stringing wire for rural telephone line near Aberdeen, Washington, in the Grand Coulee Dam region, where Pacific Tel. & Tel. Co. is speeding work on its rural lines construction "backlog."

Reconstruction... maintenance... expansion... equipment modernization programs... demands for utility services in excess of facilities... all have created a backlog of heavy work which FWD heavy-duty four-wheel-drive trucks can help you do faster, at low cost. Wherever the job may be, on or off the highway... line construction, maintenance, earth boring, pole setting, heavy lugging, emergency service... you can depend on FWD utility-engineered trucks to get more work done... to help you gain on your "backlogs."

For complete information see GraybaR or write —

THE FOUR WHEEL DRIVE AUTO COMPANY
CLINTONVILLE, WISCONSIN
Canadian Factory: KITCHENER, ONTARIO

One of a fleet of more than 100 FWDs in service with Pacific Tel. & Tel. Co.

FWD

America's Foremost Heavy-Duty Truck

Distributed by GraybaR

America's finest wholesalers

ROYAL-NOARK
Renewable FUSES

ROYAL-NOARK
Non-Renewable FUSES

ROYAL "Crystal"
the ORIGINAL
GLASS-TOP FUSES

sell the ROYAL line to

ROYAL WIRE

ROYAL CHRISTMAS
LIGHTING SETS

ROYAL
"Sealed Tight"
TROUBLE
LIGHTS

America's finest retailers

ROYAL Quality

WRITE FOR CATALOGS

WIRE • CORD SETS
CARTRIDGE and PLUG FUSES • FUSTATS
TROUBLE LIGHTS • CHRISTMAS LIGHTING SETS

ROYAL ELECTRIC CO., Inc., PAWTUCKET, R. I.

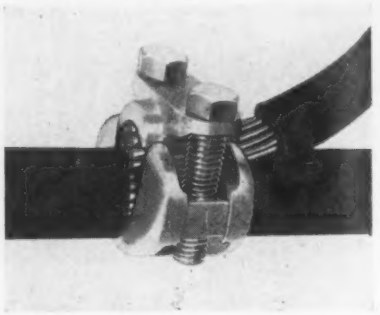
REPRESENTED BY: NORTHWESTERN AGENCIES, INC., SEATTLE, WASHINGTON
ECKERT - LLOYD CORP., SAN FRANCISCO & LOS ANGELES

Panelboards (517)

Improved Noark NTPS panelboards for controlling light and small power circuits have been put into production by Federal Electric Products Co. and are available in 4 to 12 circuits, flush or surface type. Improvements include incorporation of a steel tension spring in the switch assembly which exerts constant pressure on stationary contact parts to assure positive electrical contacts. The three current-carrying parts in the circuit have been made 30% heavier and more rugged; the panel's four-plug fuse and toggle-switch phenolic units have been redesigned for greater attractiveness and efficiency. The steel enclosure is 3⅞ in. permitting flush type panels to be mounted in thin walls of sheet rock, wall board, masonite and other materials.

Connector (518)

A one-piece connector announced by Burndy Engineering Co. is supplied in five sizes to accommodate conductors from 4/0 stranded through 1,000 Mcm. This Type KOS Uniklip has recessed bolts built into a rounded, streamlined body and is said to be easy to install in close quarters.



Flaw Detector (519)

G-E is producing a flaw detector which can continuously detect and count holes, weak spots and conducting paths in thin materials during the manufacturing process. This detector can be applied to sheet materials up to .025 in. thick moving as fast as 450 ft. per min. and to wire moving up to 100 ft. per min.; consists of an electrode assembly through which an adjustable voltage is applied to the material being tested, and an electronic circuit to indicate the flow of current through the material when a flaw passes under the electrodes. It will sound an alarm, operate a recorder or shut down the manufacturing process when flaws are encountered, and can be arranged to indicate when flaws exceed a given total. Control unit may be mounted remotely.

Packaged Supply Units (520)

Arthur E. Booth Co. has available new packaged supply units in portable or bench models to provide a-c and d-c for instrument and relay testing. The line includes a full range of a-c and d-c currents up to 10 amp; a-c and d-c potentials up to 750 volts.

Electrode (521)

For welding low-alloy cast steel or low-alloy high tensile strength rolled steels in all positions, with a-c or d-c reverse polarity, the ACP-MO electrode is being offered by Westinghouse in four diameters from 3/32 to 3/16 in.

...IT'S EASY TO HANDLE ON ANY JOB

Men who work with General Electric White rigid conduit *like* the way it handles. They're sold on it because of its true threading, its even cutting, and its smooth interior surface, which makes wire-pulling easy. Advantages like these mean that G-E White speeds construction, pleases customers. Take a tip from the men who install it—put in G-E White for construction speed and for smooth, permanent raceways.

AND WHITE GOES IN TO STAY

When jobs are done with General Electric White, you can count on it to *stay* in service. Its *hot-dipped* zinc coating—inside and out—and its hard, smooth Glyptal* lacquer finish resist the attacks of atmospheric corrosion.

Ask your nearest General Electric distributor for details on our complete raceways line—or write to Section C52-525, Appliance and Merchandise Department, General Electric Company, Bridgeport 2, Connecticut.

Trade-mark Reg. U.S. Pat. Off.

GENERAL ELECTRIC

RACEWAYS ROUND-UP

with your

Merchandise Distributor

Look to General Electric for everything you need for conduit installations. The complete line includes locknuts, bushings, connectors, wedges, reducers, enlargers, caps, ells, straps, boxes—practically all the accessories necessary to wiring safety and convenience. Try the new, exclusively General Electric, S-shaped bar hangers, too. They are adaptable to any stud spacing, and are easily and quickly installed.

The electrical flexibility of buildings equipped with General Electric Q-Floor wiring is assured, since every cell of the flooring can be used as electrical raceways as needed. Outlets, which can be placed anywhere in the floor on six-inch centers, can be added or changed with little expense. Ask us for the complete story on General Electric Q-Floor wiring.

General Electric Black conduit is a useful partner of General Electric White. It is coated with a hard, baked-on finish that provides outstanding protection from liquid chemicals, fumes, acids, and oils.

SORGEL AIR-COOLED TRANSFORMERS

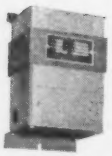
are sold at

Firm Prices

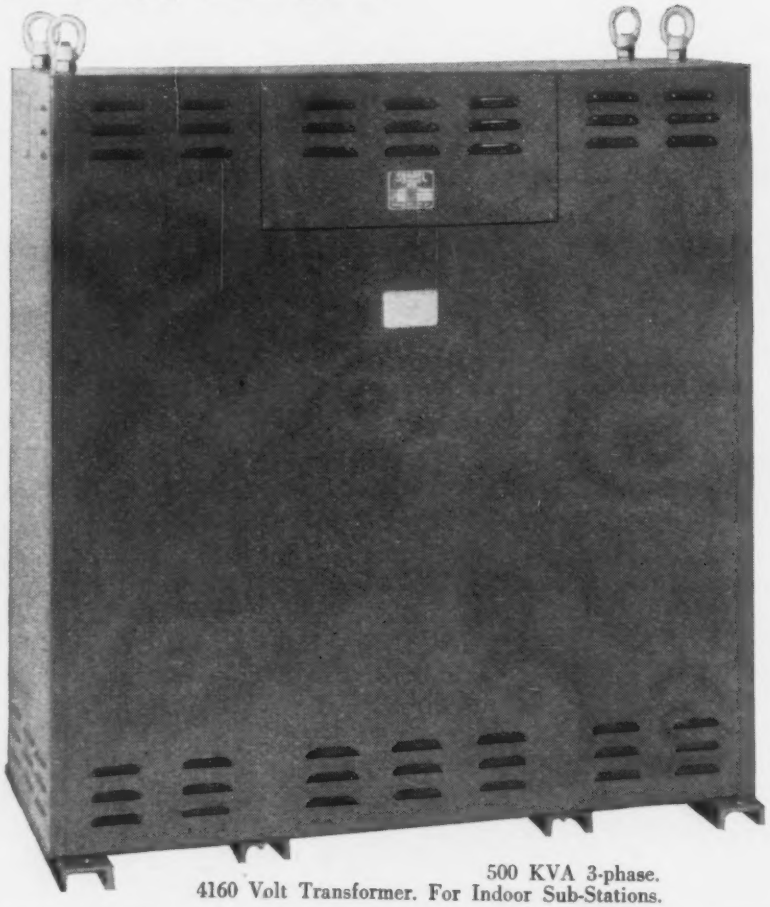
Without escalator clause.
10-day price protection on all quotations.

Definite Deliveries

We may not always be able to ship at once, but you can depend on the delivery promise given.



¼ KVA Single Phase 460/230 to 115 volt



500 KVA 3-phase. 4160 Volt Transformer. For Indoor Sub-Stations.

REPRESENTATIVES

FRED W. CARLSON
307 Wall, Seattle, Wash.
Portland, Oregon

CAMPBELL & GEORGE CO.
379 Brannan St., San Francisco

H. D. EASTERBROOK
1262 S. Boyle
Los Angeles 13, Calif.

SORGEL ELECTRIC CO., 844 W. National Ave., Milwaukee 4, Wis.

Pioneers in the development and manufacturing of Air-Cooled Transformers

Fatigue Tester (522)

Baldwin Locomotive Works is offering the Sonntag Model SF-2 for bench type fatigue testing. The machine is for sheet stock of metal, plastic or wood and is said to require no attention during tests. The manufacturer states that design of the machine eliminates need for special equipment to maintain a constant force while a specimen is under test. A revolving eccentric mass is used as a means of loading, and the load automatically remains constant regardless of the changes in the amount of deflection of the specimen, it is stated.

Welder (523)

Lincoln Electric Co.'s new Fleet Arc a-c welder is equipped with an arc booster said to augment the current the instant the arc is struck. The arc is started automatically when the electrode touches the work. A selector switch on the welder front governs the amount of booster current and is said to give a range of striking intensity to suit requirements for thin sheets or heavy plates, tack welds or various electrode types and sizes. This new welder comes in 200, 300 and 500 amperage range; both frame and housing are of all-welded construction.

Infrared Lamps (524)

Two new 125-watt infrared industrial lamps are available from G-E. One is equipped with a G-30 bulb and is designed especially for use in open-reflector ovens; has a medium skirted base, 5-in. light center length and fits infrared reflectors now in general use. The other has an R-40 reflector type bulb and a medium skirted base. Average laboratory life for both is in excess of 5,000 hours, the company says. They can be used interchangeably with 250- and 375-watt G-30 and R-40 lamps.

Yard Light (525)

A yard light added to the Seber line has a cast aluminum 14-in. reflector and a 21-in. neck of ½-in. rigid pipe. It is said to give wide light distribution with a 150-watt lamp; is furnished with socket, No. 14 wire, and cast aluminum wall flange including 2-hole insulating busing and 2-in. lag screws. Ample space for splicing is allowed under the flange.

Hinged-Glass F Unit (526)

Edwin F. Guth Co.'s new hinged-glass Aristolite features floor-level cleaning through use of a tool with a "gripper" end for opening and closing the hinged panels and a duster end. Two, three or four 40-watt sizes are available.

Closed-End Connector (527)

Aircraft-Marine Products Inc. is making a closed-end connector which it claims will make vibration-proof pigtail splices. Furnished with insulation attached, this connector requires a single operation of the AMP hand tool or press die and does not need soldering or taping.

F Ballasts (528)

Advance Transformer Co. announces that it has new types of fluorescent ballasts in production, including 60-cycle reactors of 150, 220 and 238 volts and 50-cycle 118 and 220 volts.

(522)

ffering the
pe fatigue
t stock of
aid to re-
The manu-
e machine
ipment to
a specimen
ic mass is
d the load
gardless of
eflection of

(523)

et Arc a-c
ooster said
nt the arc
tomatically
work. A
nt governs
d is said to
to suit re-
avy plates,
types and
n 200, 300
frame and
uction.

(524)

industrial
E. One is
is designed
ctor ovens;
light cen-
ectors now
n R-40 re-
um skirted
both is in
pany says.
y with 250-
ps.

(525)

er line has
and a 21-
is said to
ith a 150-
socket, No.
l flange in-
g and 2-in.
licing is al-

(526)

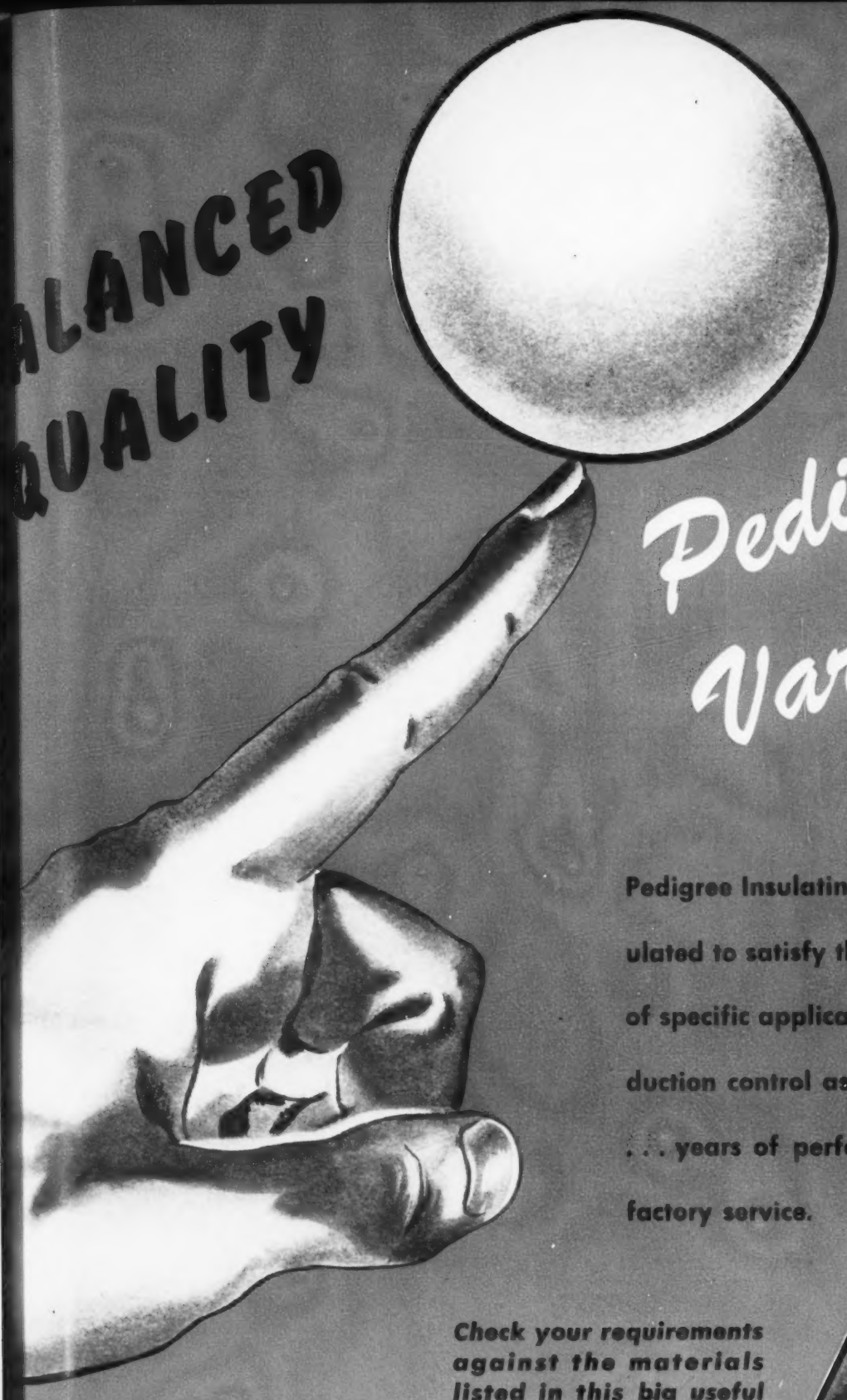
hinged-glass
l cleaning
ripper" end
nged panels
or four 40-

(527)

is making
claims will
plices. Fur-
this connec-
f the AMP
es not need

(528)

nounces that
ballasts in
reactors of
50-cycle 118

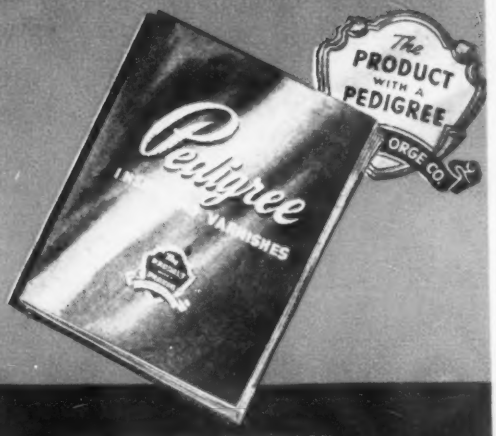


ALANCED
QUALITY

Pedigree
Varnishes

Pedigree Insulating Varnishes are formulated to satisfy the exact requirements of specific applications. Laboratory production control assures uniform quality . . . years of performance assure satisfactory service.

Check your requirements against the materials listed in this big useful book.



Distributed by

INSULATION MANUFACTURERS CORPORATION

INSULATION AND WIRES INCORPORATED

TRI-STATE SUPPLY CORPORATION

Manufactured by

THE P. D. GEORGE COMPANY, ST. LOUIS, U. S. A.

BRONCO
WIRE
is tough!
WESTERN
Bronco has what it takes to meet your toughest requirements. You can be sure of maximum performance —with Bronco.
WESTERN
INSULATED WIRE CO.
1001 E. Sixty-Second St.
Los Angeles 1, California
FOR WIRE IN THE WEST— IT'S WESTERN

BULLETINS ETC.

Photolamp Data Sheet (529)

A revised photolamp data sheet, featuring a section on flashtubes and new photolamp specifications, has been announced by General Electric Lamp Dept. Special sections of the booklet describe the G-E repeating flashtubes, blue filter lamps for color photography, photoflood and photospot lamps, flash lamps, photographic uses of fluorescent lamps, projection lamps, studio lights, and photo enlarger lamps. Specifications of the lamps and exposure data are included.

The Triangle Lighting Formula, introduced recently by G-E, is explained and exposure data included. Changes made in revising the photolamp data sheet: specifications of the SM photoflash lamp; an exposure note added to the section on triangle lighting; the flashtube section; addition of a projection lamp section; new photographs and sketches.

Connectors for Aluminum (530)

Bulletin M-3, describing a full line of standard, compression type connectors for aluminum, has been published by Burndy Engineering Co. It lists terminals, couplers, parallel tap and T-connectors supplied in either bolt and screw clamp types or Hydent indent types, for a range of wire sizes from No. 12 to 1,000 Mcm. These connectors feature the use of either plated copper alloy to prevent electrolytic action or plated aluminum to inhibit formation of aluminum oxide.

Stud Welding (531)

The role of stud welding in the installation of wiring conduit, outlet boxes, and other electrical equipment in steel frame structures, is described in a new 36-page brochure on the Nelson electric arc stud welder and flux-filled studs. The booklet explains operating principles, and shows various types of equipment which have been developed to handle the installation of standard and specialized studs, ranging from 1/8 to 3/4-in. in diameter, and in lengths up to 8 in. Also listed are specifications for standard studs as well as tables of physical properties. Typical electrical applications in the construction field illustrated in the booklet include insulators, transformers, cable terminals, and electrical gutters.

Equipment Bulletin (532)

Allis-Chalmers products for heating, ventilating and air conditioning are presented in a new bulletin. Equipment described includes Texrope V-belt drives, centrifugal pumps, a-c and d-c motors, a complete line of motor control, dry type transformers and a-c and d-c welders.

Oil Circuit Breakers (533)

A revised bulletin on Allis-Chalmers oil circuit breakers, Type DZ-40B, has been announced by the company. In addition to describing the construction of these breakers and listing protection features, the 4-page bulletin lists accessories and provides a table of maximum current, voltage and interrupting capacity ratings together with a reference chart of general dimensions.

Contact Ratings (534)

A Railway & Industrial Engineering Co. publication lists new ratings of that company's line shorting contactor. This sheet is supplementary to page 3, Bulletin 1382.

Lineman's Equipment (535)

Utilities Safety Supply Co. has prepared a pocket type catalog of its line of belts, safety straps, climber straps and pads. Included is the recently added tool belt.

Heavy-Duty Trucks (536)

Four Wheel Drive Auto Co. has a folder on its 10- and 12-ton trucks for heavy-duty service.

ELECTRICAL WEST, 68 Post St., San Francisco 4, California
Please send me information about following CIRCLED items:

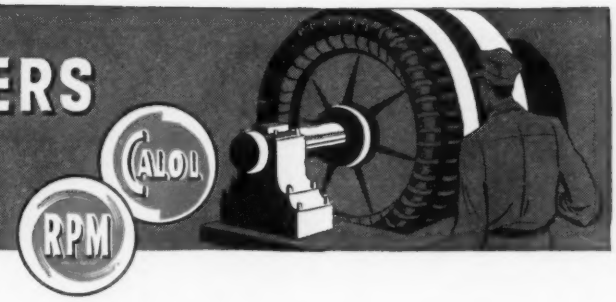
500	501	502	503	504	505	506	507
508	509	510	511	512	513	514	515
516	517	518	519	520	521	522	523
524	525	526	527	528	529	530	531
532	533	534	535	536			

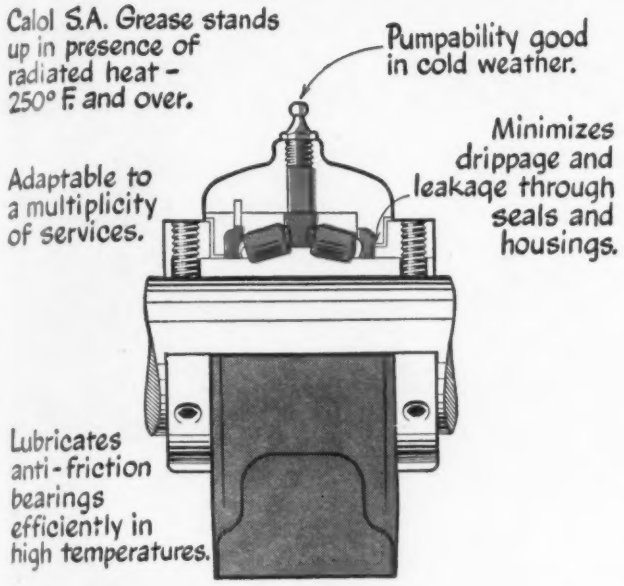
Name . . . . . Company* . . . . . Title* . . . .

Address . . . . . .

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

STANDARD ENGINEERS NOTEBOOK




Calol S.A. Grease stands up in presence of radiated heat – 250° F. and over.
Pumpability good in cold weather.
Minimizes drippage and leakage through seals and housings.
Adaptable to a multiplicity of services.
Lubricates anti-friction bearings efficiently in high temperatures.

More positive lubrication in high temperatures

Drippage and leakage from bearings that must operate in high ambient temperatures can be materially reduced by using Calol S. A. Grease.

This special grease is made from a sodium-aluminum base and selected oils with high heat-resistant qualities. In many instances it has provided satisfactory lubrication where bearing temperatures, due to radiated heat, are as high as 250°F. and over. It can be applied easily in all seasons as it has good pumpability in cold weather.

Calol S. A. Grease can be adapted to a great many services in various industries. It was, however, originally developed for anti-friction bearings. Tests in the field and on the Navy Ball Bearing Machine have proved it excellent for low-, medium-, and high-speed bearings of the anti-friction type.

There are three grades of Calol S. A. Grease: No. 00, No. 0 and No. 1. It is packed in 35-, 108- and 420-pound containers.

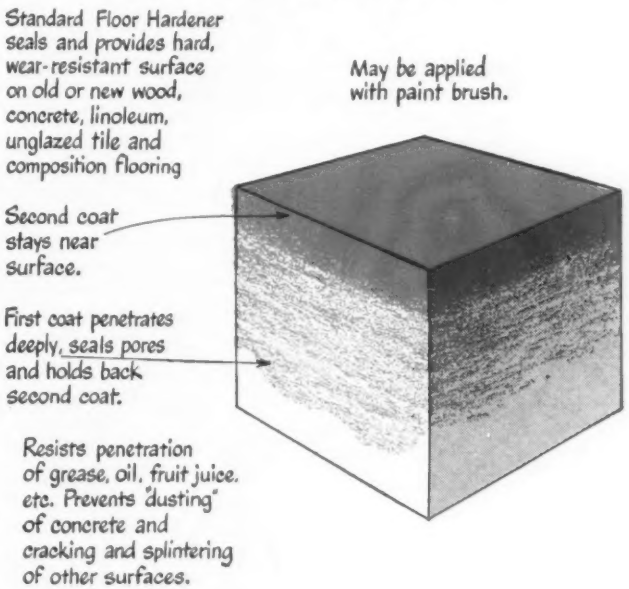
Trademark "Calol," Reg. U. S. Pat. Off.

Special hardener reduces wear on plant floors

Because it hardens the texture of flooring and produces a non-slippery, tough surface, Standard Floor Hardener minimizes wear on plant floors. It prevents grit from being ground into the floors and helps seal out grease, oil, fruit juice, etc.

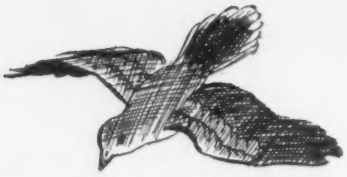
Standard Floor Hardener is made from special petroleum oils, wood oils, gums and thinners like those used in the manufacture of quality varnishes. It penetrates deeply into concrete, wood, linoleum, unglazed tile and composition flooring and seals the pores. It should not be used on rubber or asphaltic surfaces.

Standard Floor Hardener provides an ideal base for the application of floor polishes and makes surfaces much easier to clean. On concrete floors, it resists decomposition or "dusting". On wood and other types it prevents cracking, chipping and splintering. Depending on porosity of a floor, a gallon covers up to 600 square feet.


Standard Floor Hardener seals and provides hard, wear-resistant surface on old or new wood, concrete, linoleum, unglazed tile and composition flooring
May be applied with paint brush.
Second coat stays near surface.
First coat penetrates deeply, seals pores and holds back second coat.
Resists penetration of grease, oil, fruit juice, etc. Prevents "dusting" of concrete and cracking and splintering of other surfaces.

Standard Fuel and Lubricant Engineers are always at your service. They'll gladly give you expert help — make your maintenance job easier. Call your local Standard Representative or write Standard of California, 225 Bush St., San Francisco 20, California

FOR EVERY NEED A STANDARD OF CALIFORNIA JOB-PROVED PRODUCT



A bird's-eye view of good guying-using

OLIVER GUYING MATERIALS

BOLTS

Oliver bolts include the following types—machine, carriage, double arming, eye and —shown below—thimbleye. Sizes as required.

GUY CLAMPS

All sizes—for 1/8 to 3/8 inch strands, one to four bolts.

STRAIN INSULATORS

Complete line for guying and other services. Dry or wet process porcelain.

STRAIN PLATES

Protect poles against cutting of wrap-around guy strands. Help prolong life of guying.

GUY HOOKS

Prevent slipping by supporting guy strands. Light, medium or heavy sizes.

ANCHOR RODS

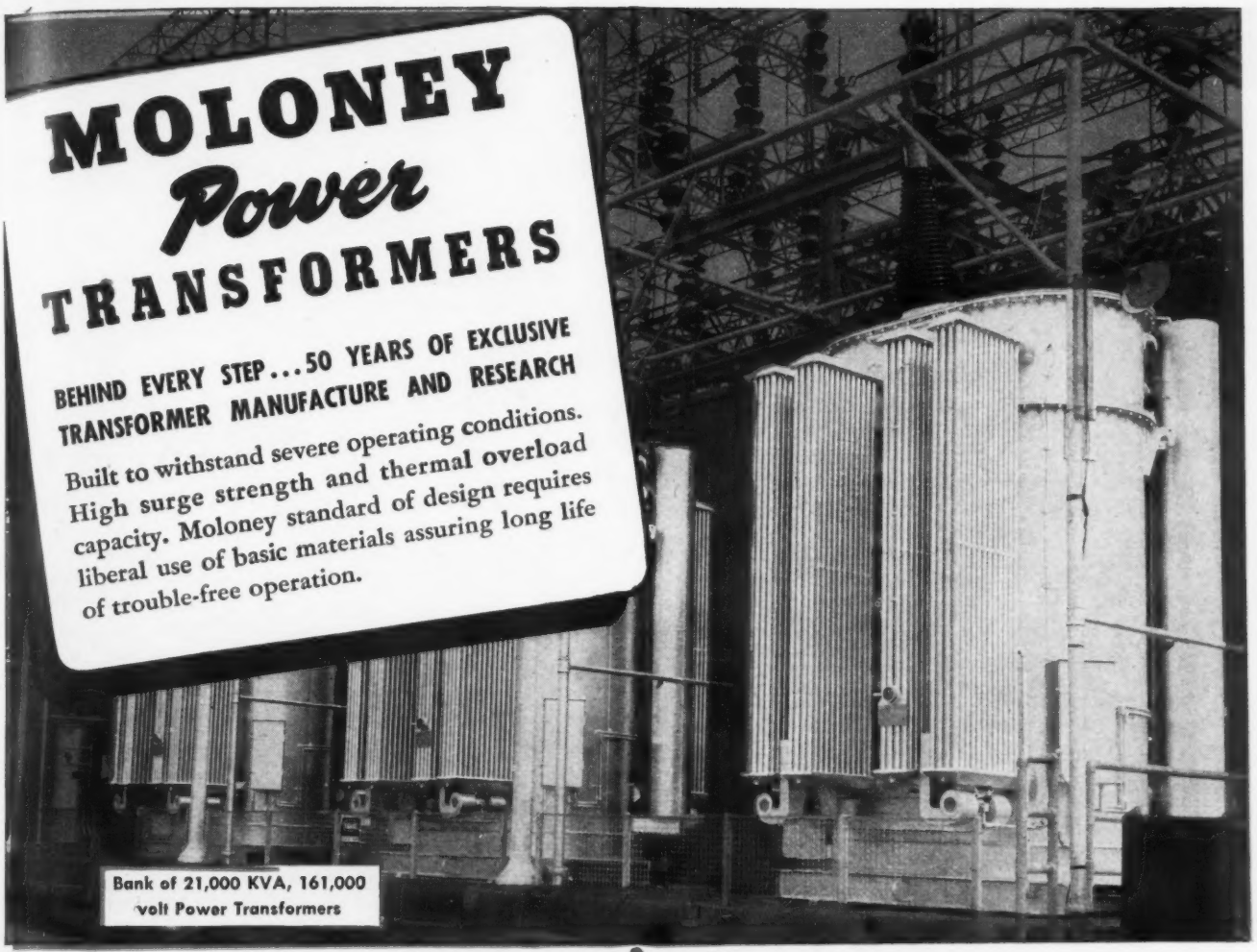
Many types and sizes, to provide for all guying requirements. Service-proved features.

OLIVER
IRON AND STEEL
CORPORATION
South Tenth and Muriel Streets
Pittsburgh 3, Pennsylvania

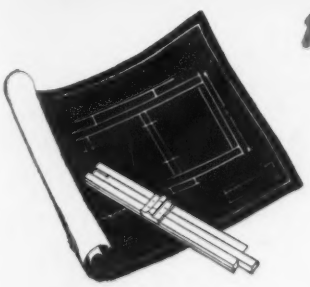
MOLONEY *Power* TRANSFORMERS

BEHIND EVERY STEP...50 YEARS OF EXCLUSIVE TRANSFORMER MANUFACTURE AND RESEARCH

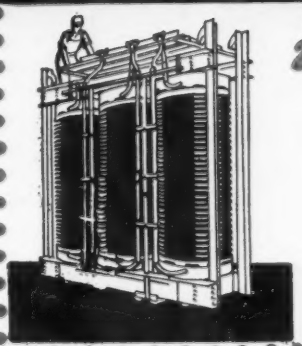
Built to withstand severe operating conditions. High surge strength and thermal overload capacity. Moloney standard of design requires liberal use of basic materials assuring long life of trouble-free operation.



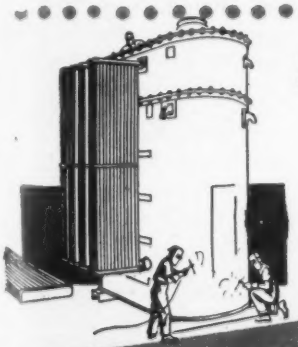
Bank of 21,000 KVA, 161,000 volt Power Transformers



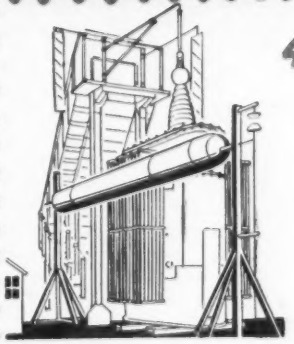
1. **Engineering research** is a vital part of the Moloney program of building transformers of advanced design. Fifty years of exclusive transformer manufacture have brought technical "know-how"... fifty years of engineering research have developed far-reaching improvements in design, processing, and fabrication. These are the factors which contribute to the trouble-free operation of Moloney Transformers.



2. **Core type construction** is standard on all Moloney Power Transformers... permitting maximum amount of winding surface exposed to the oil, for efficient dissipation of heat and reduction of hot spot temperatures. Circular windings provide greatest possible protection against distortion under the most severe operating conditions. Cores are of low-loss, silicon steel laminations properly annealed and carefully assembled.



3. **Tanks** are electrically welded, made of high-grade open-hearth steel especially suited for the purpose. These tanks are provided with rugged Z-bars or strong welded box type reinforcements. Bases are of heavy welded channel iron construction. Radiators are of all-welded construction, tubes are spaced for easy cleaning and painting, all welds are external, headers are designed so water cannot stand on surface.



4. **Tested!** Besides numerous test boards for standard transformer tests, Moloney has complete facilities for making impulse tests. The Moloney 2,500,000 volt Surge Generator, with its recording cathode ray oscillograph, is available for impulse testing all ratings of transformers. Moloney Transformers are tested to meet the most rigid specifications for real "on-the-job" performance.

...OVER 50 YEARS OF LEADERSHIP IN DESIGN, RESEARCH, ENGINEERING

MOLONEY ELECTRIC COMPANY

ST. LOUIS 20, MO.

POWER AND DISTRIBUTION TRANSFORMERS EXCLUSIVELY SINCE 1896

ELECTRA'S HUSBAND

"WELL," Electra said, "it seems you were right."

"Of course," I said. "About what?"

"About those co-ops," she explained.

"Oh, those," I said. "They're going to town, all right. And I hope it won't be long before they reach the cleaners. But what brings them up?"

"Just that Kate and I were down in the Valley today," Electra said. "In one of those little towns—I forget which—we passed a co-op appliance store."

"Any merchandise on display?" I asked.

"No more than in any other store," she answered. "We just went on by. But I think I saw a washer and a home freezer and maybe a radio."

"Well, there's one thing about the co-ops," I said. "They're not having any easier time getting out appliances than any of the other manufacturers. But they're still looking forward to big things. And if Congress doesn't do something soon, they're sure enough going to realize them."

"You mean, nothing's been done yet about making them pay federal income tax like Fulton Lewis said on the radio the other night?" Electra exclaimed. You could see her thinking back to March 15.

"Not yet," I said. "But things are coming along." And with that I went back to my paper.

Somehow, though the subject kept bobbing up in my mind. So next day I looked up some facts and figures. And sure enough, they weren't any more encouraging than I thought they were.

"In case you're interested," I told Electra that evening, "the co-ops are getting into appliance retailing in an even bigger way than I thought. National Cooperatives, the big outfit that manufactures and distributes the co-op lines of cigarettes, cosmetics, electric appliances, tires, toothbrushes and vitamin pills, expects to do a business of $45,600,000 this year. It has 17 wholesalers and 2,300 dealers.

"Not all of those dealers, of course, are set up to handle the entire co-op line. Only about a quarter of them are, in fact. But a lot of the other stores that handle appliances along with gas and groceries and farm supplies are figuring to set up on a full-line basis this year. And in addition, there's a pretty good number of REA cooperatives that either sell or plan to sell appliances."

"And just what do all these stores think they're going to sell?" Electra asked.

"Oh, they'll handle just about what every other appliance store handles," I answered. "And some extras besides. Refrigerators, home freezers, radios, washers, ironers, vacuum cleaners, electric water heaters, water systems and milking machines. And they're figuring on gas and electric ranges, gas water heaters, oil burners, oil space heaters, stokers, milk coolers and a complete line of small electrical appliances.

LET'S HAVE RULES THE SAME FOR ALL

"I said they were going into this business in a big way, and I wasn't kidding."

"Yes, but isn't anyone going to stop them?" Electra said. "You've said yourself there are too many people selling appliances already. And if these fellows get into it—."

"That isn't the point," I said. "The appliance business may be crowded now. But in this country, anyone who wants to sell appliances—or any other thing, for that matter—has a perfect right to try.

"The real point—the crux of the matter, as they say—is that the co-ops don't pay income tax the way the ordinary business man does. And that means they're going to run a lot of good, taxpaying citizens out of the businesses they've spent years building up, and keep a lot of GI's from going into the businesses they'd like to start."

"You've said all that before," Electra said sharply. "What I really want to know is whether all you important business men aren't going to get action out of Congress before the whole country goes cooperative?"

"We will," I said. "Don't you worry.

"In fact, so many fires are being built under the co-ops right now that they're beginning to twitch like a frog with its legs off. If you want the truth, they're scared stiff. They yelled when the House of Representatives, in Washington, set up a new Small Business Committee, because they're afraid there'll be an honest investigation of their competitive advantage, to take the place of the whitewash that was put out a year ago. They're frightened of the noises the Ways and Means Committee is making, leading up to hearings in May on all tax-exempts and how to make them pay taxes. And every time a co-op group gets together, they draw up some kind of resolution saying that maybe there is something to be said for paying income tax, only it would be a whole lot better if independent business just paid its earnings to customers the way the co-ops do."

"You mean to heck with me and my ten shares of stock—let's distribute what we make to Mr. and Mrs. John Q. Public?" Electra asked.

"Right on the button," I said. "To heck with the stockholders. To heck with the profit system. To heck with the young men who want to go into business for themselves. To heck with the government's need for the taxes that keep it in business."

"No one you know in business takes that sort of scheme seriously?" said Electra, a question in her tone.

"I sure hope not," I said. "Because if they do, they just ain't a-going to have any business left. There'll be only a new form of government—a cooperative commonwealth or socialist state or something of the sort."

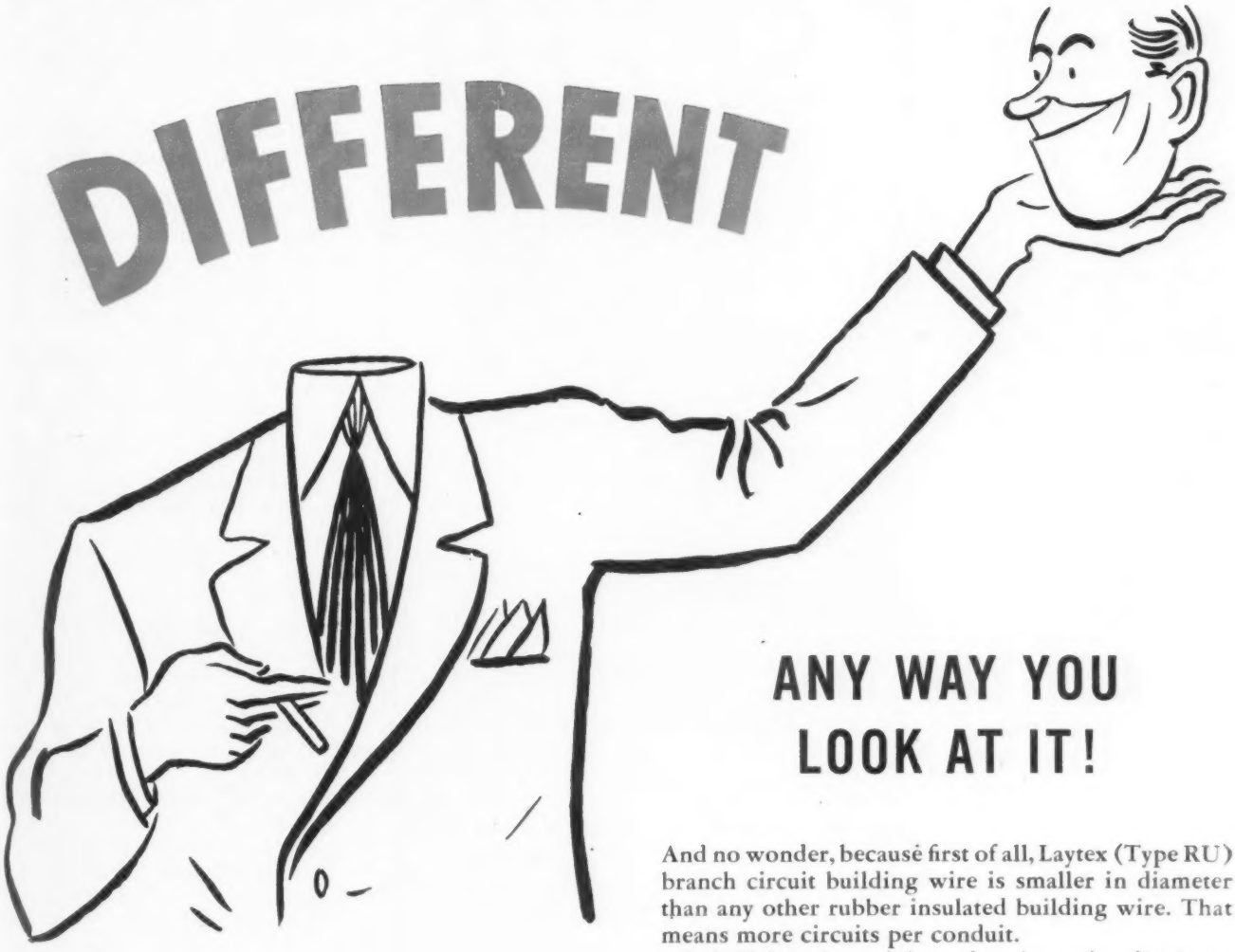
"It just isn't possible to have an economy in which half of the operating organizations pay taxes and the other half do not. It's got to be all one way or the other. Either we have a set-up with all businesses operating under the same set of rules or the government must take over."

"Well, just to be on the safe side, I think you and your friends ought to let your horse out another notch," Electra said. "Seems to me, if you have the co-ops on the run, you ought to keep after them until you've got them corraled."

UNITED STATES RUBBER COMPANY

SERVING THROUGH SCIENCE

DIFFERENT



ANY WAY YOU LOOK AT IT!

RU wiring with RU?

Small diameter. Light weight. Natural rubber insulation. Perfectly centered conductors. High tensile strength. High dielectric strength. Flame retardant, moisture resistant cover.

And no wonder, because first of all, Laytex (Type RU) branch circuit building wire is smaller in diameter than any other rubber insulated building wire. That means more circuits per conduit.

It is lighter in weight and easier to handle, has a saturated cotton fibrous cover that is flame-retardant and moisture-resistant.

Laytex (Type RU) is insulated with laminated walls of 90% unmilled, grainless natural rubber. This forms a homogeneous sheath around perfectly centered conductors, eliminating the possibilities of thin spots.

In physical and electrical properties, *Laytex has no equal.*

UNITED STATES RUBBER COMPANY
1230 Avenue of the Americas • Rockefeller Center • New York 20, N.Y.

U.S. LAYTEX — THE FINEST BUILDING WIRE ON THE MARKET

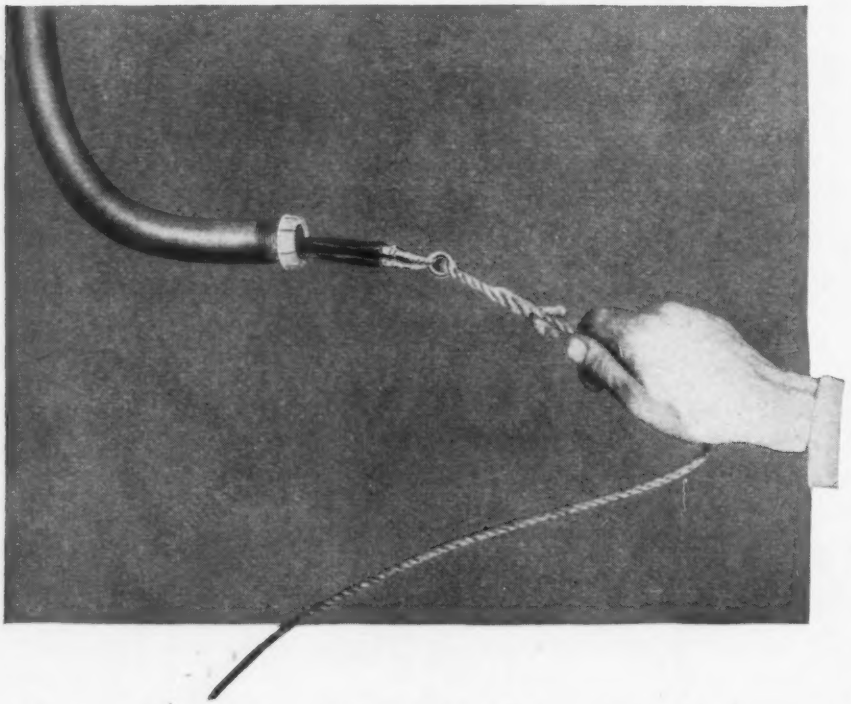
U.S. Laytex

Reg. U. S. Trade Mark

ELECTRICAL WIRES AND CABLES

UNITED STATES RUBBER COMPANY · US · TRADE MARK

Less pull MORE SPEED



● The smooth, waxed, low-friction surface of General Electric's thermoplastic building wires shows up in *time saved* when pulling wires through conduit. Compared to other types of wire of equal capacity, it takes less "pull," makes fishing easier when joints and angle bends are encountered. And the tough, abrasion-resistant finish protects the insulation from possible damage.

No wonder General Electric thermoplastic has moved up so fast as a favorite among contractors and their customers alike. For, in addition to its smooth surface, it has cost-saving advantages *all the way through.* It strips easily. It is practically nonaging. It is virtually unaffected by oil or water. It has made possible building wires of small diameter, without lowering insulation standards.

Don't risk buying, or specifying, building wire by type alone. First, get all the facts about General Electric's thermoplastic building wire by writing to Section W51-525; Appliance and Merchandise Department, General Electric Company, Bridgeport 2, Connecticut.

Thermoplastic
First . . . and foremost
Type T Building Wire

GENERAL ELECTRIC

AROUND THE CIRCUIT with your

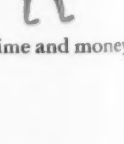
Merchandise Distributor

G. E. OFFERS A COMPLETE LINE OF BUILDING WIRES

Besides G-E thermoplastic, Types T and TW, for dry and wet locations, there are standard code grade building wires, Types R and RH, (Type RH in sizes 6 Awg and larger can often be used more economically than Type R, because of its higher current rating). In addition, G.E. offers Types RW (moisture resistant), RD (flat twin-braided building wire), and RL and RHL (leaded cable construction).

GETTING YOUR SHARE? There's good business . . . and good profits . . . in replacement cords for portable tools. And when you use Flamenol* portable cords, you're sure of the reliable performance and long-term service that are your best bets for satisfied customers. Rip-cord, medium-duty, and heavy-duty types available.

DO YOU KNOW ABOUT PVX? Here is a light nonmetallic sheathed cable that is ideally suited for use in residential and farm construction. Durable, easy to install, and always good protection from service hazards, PVX saves time and money. Ask us about it.



BX* GOLDEN ANNIVERSARY — Fifty years ago General Electric introduced BX armored cable. Today, the improved BX cable is manufactured with a bonding strip to assure low value of armor resistance. Let us show you samples.

*Trade-mark Reg. U. S. Pat. Off.

MAY 1947 Vol. 98, No. 5

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED SECTION OF THE U. S.

REPORT ON HEAT PUMPS

If a unit of fuel is burned in a central station and the derived electrical energy less 20% line losses is delivered to a heat pump in a home, there will be more heat in the house than had the unit of fuel been burned there in an ordinary home furnace.

If a home has a heat pump, it also has an air conditioner, since the two are one, and the electrical load, throughout the entire year is therefore remarkably flat.

For those reasons heat pumps offer possibilities of unprecedented economy in home heating, excellent utility load and conservation of natural resources on a gigantic scale. Furthermore, they have the potentials of bringing home air conditioning within the reach of millions of people to whom it has heretofore been unthinkably expensive, and of providing these same people with clean, healthful, fireless heat at a lower cost than they are now paying for keeping warm by more primative, less satisfactory means.

Heat pumps are here today. They can be purchased in 3-hp., 5-hp. and larger sizes. Their performance ratios (ratio of energy delivered to energy purchased) are on the order of four. A 3-hp. unit costs a little over $2.000.

Present price is one of the obstacles to immediate universal application of heat pumps. Even at today's prices, however, virtually every commercial occupancy and many residences are heat-pump prospects, except within a few zones where summer air conditioning is almost never desired, and where, also, the winter heating bill is moderate. In the West, these zones are probably confined to a coastal strip, extending only a few miles inland in southern California, reaching a little farther inland as it passes through Oregon and Washington, and disappearing somewhere in Canada as it enters the regions of severe winter.

If the cost of heat pumps should decline to the $1,000 bracket which some heat-pump men feel is conceivable, over a matter of years—heat pumps would become economically feasible for almost every indoor heating application, except in those zones where both summer and winter climates are extremely mild.

While cost is an imposing factor in the marketing of heat pumps today, there are others of even greater immediate significance. For while cost may define the scope of the eventual mass market, today's market is sufficient to keep existing productive capacity running full blast for years to come. The factors aside from cost are those associated with the inertia which any revolutionary idea is likely to encounter.

And heat pumps are revolutionary insofar as customers in general are concerned. Although it is nearly 100 years since Lord Kelvin described the refrigeration cycle in reverse and characterized it as the heating process of the future, pumping heat has for the most part been regarded as a scientific novelty. A few installations in the West date back several years, but most of them are no older than the '30's, and it is only recently, especially since the war, that a heat pump could be purchased as a ready-made package.

A survey would doubtless show that most people have never heard of a heat pump, wouldn't immediately believe it if they heard about it now. Perhaps it should be said, "won't immediately believe it when they do hear about it," for it now appears certain that many people are going to learn about heat pumps soon.

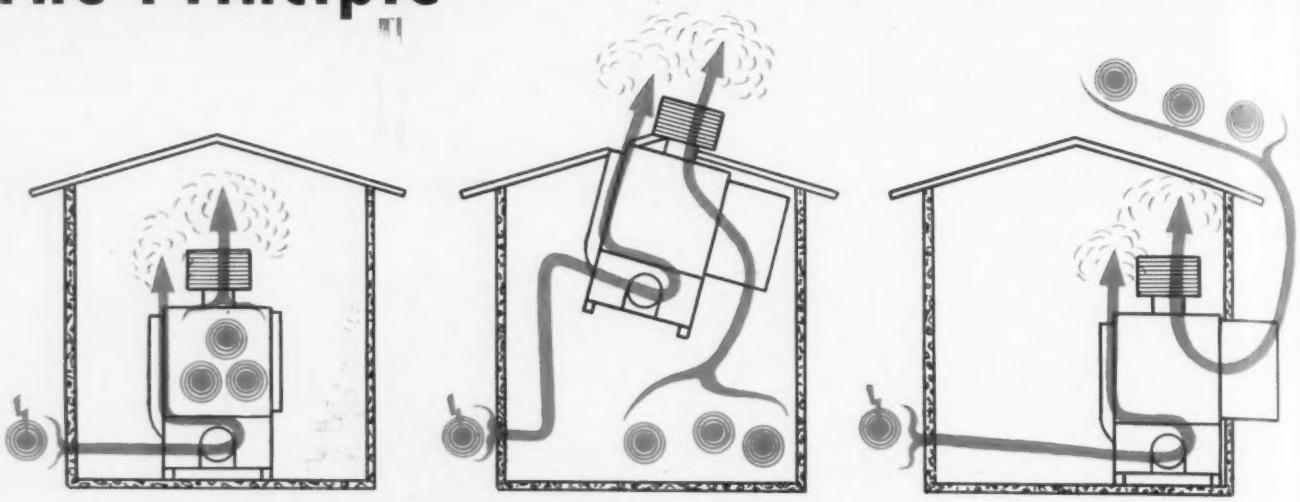
Customer education, orderly arrangement of performance data from actual heat pumps in various types of structures in various climates, studies of heat pumps as loads on specific utility systems, the relating of heat-pump characteristics to public demand for the qualities heretofore associated only with certain forms of electric heat, dissemination of information as to available equipment and its requirements, education of utilities and distributing channels in sales technique—all these are needed now.

Equipment

Practical difficulties with heat pumps have for the most part been associated with the source of heat. The illustration on the next page shows an ordinary household refrigerator, in which the air around the freezing coils constitutes the heat source.

When coils are cooled in this way, so that frosting occurs, the rate of heat transfer is greatly cut down. Another difficulty with air is that its temperature changes, temperature of the outside air (the heat-source air) being lowest when the heating requirement is greatest. This has two adverse effects. On the one hand, it means that

The Principle



Install an ordinary refrigerator in a house, one with the machinery at the bottom, the cooling compartment in the middle, and one of the old G-E monitor tops up above. In the picture at left one unit of heat is taken in the form of electricity from the power lines. Where does it go? Well, either it goes out of the monitor top or out the vent. At the same time it is making the refrigerator move three other heat units from the cooling compartment out by way of the top. The refrigerator is cooler and the house is warmer. The whole interior, refrigerator and house together, are warmer by exactly one unit—the unit taken in from the lines. Next stick the refrigerator through the roof. Not a very practical arrangement, but it gives the idea. Open the refrigerator door. The same process goes on, but this way the room is cooled. Next, cut a hole in the house wall and open the refrigerator door to the outdoors. Now every time one heat unit is purchased, three more are brought into the house

The Equipment

Table I—Airtopia Data

MODEL 300 Ventilating Air C. F. M. 1,800 . . . Ventilating fan hp. ¾

Heating Cycle				Cooling Cycle			
Outside Air Temp.	Speed	Capacity B.t.u. Hr.	Kw. Input*	Outside Air Temp.	Speed	Capacity B.t.u. Hr.	Kw. Input*
30	Full	34,600	2.90	70			
40	Full	38,800	3.12	80	Full	38,000	2.90
50	Full	42,700	3.36	90	Full	37,300	3.22
60	Full	46,000	3.31	100	Full	36,500	3.50

Model 500 Ventilating Air C. F. M. 3,000 . . . Ventilating fan hp. 1

Heating Cycle				Cooling Cycle			
30	½	31,000	2.80				
	Full	58,000	4.80	70			
40	½	35,800	2.80	80	½	40,500	2.71
	Full	65,000	5.24		Full	63,100	4.23
50	½	39,700	2.80	90	½	40,000	3.23
	Full	72,000	5.60		Full	62,000	5.26
60	½	43,000	2.81	100	½	39,000	3.89
	Full	77,000	5.60		Full	60,000	5.39

MODEL 750 Ventilating Air C. F. M. 4,500 . . . Ventilating fan hp. 1½

Heating Cycle				Cooling Cycle			
30	½	46,500	4.25				
	Full	87,500	7.32	70			
40	½	54,000	4.25	80	½	59,600	4.10
	Full	97,000	7.84		Full	96,000	7.20
50	½	60,000	4.25	90	½	59,000	4.85
	Full	108,000	8.40		Full	94,700	7.86
60	½	65,000	4.25	100	½	58,000	5.51
	Full	115,000	8.34		Full	91,600	8.62

MODEL 1000 Ventilating Air C. F. M. 6,000 . . . Ventilating fan hp. 2

Heating Cycle				Cooling Cycle			
30	½	62,000	5.60				
	Full	116,000	9.60	70			
40	½	72,000	5.60	80	½	81,000	5.42
	Full	130,000	10.48		Full	126,000	9.46
50	½	79,400	5.61	90	½	80,000	6.47
	Full	144,000	11.20		Full	124,000	10.54
60	½	86,000	5.62	100	½	78,000	7.35
	Full	154,000	11.20		Full	120,000	11.56

* Does not include kw. input to ventilating fan motor as this fan would be required in any air circulating system and the input to this motor is not chargeable to the energy required for heating or cooling.

A Bibliography

Heat Pump Report and Program. "Electrical World," April 27, 1946. Philip Sporn, executive vice-president, American Gas & Electric Service Corp., reviews utility programs aimed at accumulating heat-pump data, raises pertinent questions as to marketing problems, describes efforts to set up equipment specifications, both for space and water heating units.

Practical Aspects of the Heat Pump. "Electrical West," April 1945. F. W. Jordan of Westinghouse examines heat pump principle, discusses basic types, and gives operating data on the heat pump in Westinghouse's plant at Emeryville, Calif.

The Heat Pump. "Distribution," April 1947. In this General Electric quarterly, P. M. Currier, of the company, points out briefly how coal can deliver more heat to a home if burned in a central station to supply electricity to run a heat pump. Such heating would conserve natural resources.

New Heat Pump Utilizes Buried Coil. "Electric Light and Power," November 1946. Gives comprehensive data on an experimental unit in the home of an Indianapolis inventor, where the refrigerant itself is circulated through coils in the earth.

The Heat Pump. "Architectural Forum," November 1946. Explains heat pump possibilities to architects and gives brief information on available units. Excellent schematic illustrations. Describes also an Idaho installation where refrigerant is circulated through pipes in the house walls.

Reversed Heat Engine Cycle Used in Packaged Air Conditioner. "Electrical Manufacturing," July 1946. C. E. Clancy, consulting engineer for Drayer-Hanson, gives considerable data on that firm's units and sets forth the technical fundamentals relating to heat-pump applications in general.

Heating With Reversed Refrigeration. Electric Heating Bulletin No. 54, Southern California Edison Co., discusses climatic considerations, gives details on Edison district office installations.

Table II—Marvair Data

Motor Size	Width	Length	Height	Weight	Heating Capacity @ 50° W	Cooling Capacity @ 75° W
3 hp.	28	40	34	845	60,000 B.t.u.	32,000 B.t.u.
5 hp.	28	40	34	1,075	100,000 B.t.u.	54,000 B.t.u.

a larger volume of air must be handled to extract a given amount of heat. On the other hand, the performance factor of a heat pump is inherently smaller the larger the temperature difference across which the device is pumping.

Recent developments have been along two lines. One has refined the heat-exchange devices to the point where the difficulties of extracting heat from air are largely eliminated, so long as outside air temperature doesn't get much below 30°F. The other has sought to utilize heat from the earth.

The idea of taking heat from the earth is not in itself a new one—many of the early applications used well water as a heat source. But pumping large quantities of water from wells introduced both water supply and water disposal problems.

The newer devices do not consume water, but utilize a closed circulating system buried in the earth.

Drayer-Hanson

An ELECTRICAL WEST survey of air-conditioning and other manufacturers who might be presumed to be prospective heat-pump producers, revealed only two who are actively in the market with standard heat-pump products as such. Air-conditioning equipment can of course be turned into a heat pump, with much or little difficulty, depending on the type and location of the particular equipment.

In the West there is one heat-pump manufacturer, the Drayer-Hanson Co. of Los Angeles, whose units are called Airtopia.

The Airtopia air-to-air unit (far left) comes in several standard sizes, which, together with performance data, are shown in Table I. These units provide heating, cooling, humidification, filtering and circulation, together with automatic time and temperature control, so that one electrical connection, in addition to air ducts, is all that is required in the way of installation, and operation is automatic the year round.

An air preheater, which is supplied by super-cooling the working liquid (Freon 12) minimizes the difficulties usually associated with air as a heat source, providing wide-range efficiency within regions of moderate winter climate. Recent developments at Drayer-Hanson promise to improve performance to the extent that output capacity on the heating cycle is kept substantially constant throughout the entire range of appropriate working temperatures.

For cooler climates, Drayer-Hanson expects to make available soon a model which draws heat from the earth, through a device called the "earth root." The earth root consists of a U-tube enclosed in an outer pipe or

shell which, at its lower end, carries a series of metallic fins, several feet long. When the assembly is driven into the ground, the fins are caused to splay out, much in the manner of the roots of a tree. The root is driven to an earth depth on the order of 40 ft.—the region where earth temperature equals mean annual atmospheric temperature.

Drayer-Hanson is pitching primarily at the commercial market with six years' production experience behind them. A few of their units are, however, installed in residences.

Muncie Gear Works

Marvair (page 63) is the product of Muncie Gear Works, of Indiana. It is being produced in 3-hp. and 5-hp. sizes, details concerning which are given in Table II. The 3-hp. Marvair has been installing for $2,250 complete, and the 5-hp. unit for $2,650.

Marvair utilizes an earth heat source through a closed system consisting of a U of 1-in. pipe sunk in a 4-in. to 5-in. bore to a depth of 200 ft., more or less, depending on local conditions. Quoted prices include this installation.

Muncie advertises Marvair as "one compact unit (for) homes, offices, or small commercial buildings," and says, "For heating in rural homes, Marvair opens up a field of automatic heating in which it has no competition." All of which indicates their estimate of market potentialities.

System Economics

P. M. Currier of General Electric's power distribution division writing in that company's magazine *Distribution* for April 1947, made an interesting analysis of the long-range potentialities of heat pumps.

He started with a pound of coal from coal running 14,000 btu. per pound. Burned in an ordinary good furnace in a private house the pound of coal would yield about 7,000 btu. to the heating system, the efficiency of the system being taken at 50%. Burned in a modern central station, the coal would yield about 1 kwh., or 3,415 btu. If losses to the house ran 20%, the house would get 2,732 btu. If this were put into a heat pump having a coefficient of performance of three, the house would get 8,196 btu. 16% better than the furnace. If the coefficient of performance were five, the house would get 13,360 btu., or almost twice the heat from the furnace.

The same line of reasoning could be applied to any fuel.

Southern California Edison Co., in its Electric Heating Bulletin No. 54, says the following about heat pumps as a utility load:

"It is necessary in our approach to the use and application of the heat pump, that many among us should form an entirely new concept as to what it is, what it will do, and why it does it. We should have no preconceived ideas as to its limitations and its possibilities. It should be approached with an unbiased engineering sense and without fear of precedents. Fifteen years of experimental work and practical successful application in southern California provide a vast store of valuable information—knowledge that is power to do what many, at one time, thought was the impossible.

"We must, therefore, purge our thinking on the problems in terms or conclusions that are not based on fact. Great advance has been made in the art and much will be done in the future. Let none of us say, 'It can't be done.' This is just a good challenge for someone to do it sometime, somewhere. Many improvements have been made in design and application that have solved problems which seemed almost unsurmountable. It is true, mistakes have been made on jobs, but these have, in most cases, been stumbling blocks that have been converted into stepping stones for improved equipment, advanced methods, or better applications and design. Truly we may say, *The Fantasy of yesterday is the Reality of today.*

"It is rather difficult to determine the performance factor of the average job except by test for certain specific load conditions. Over-all annual performance factors will exceed 3 to 1 in a well-designed plant and test factors of C.O.P. under favorable conditions have been known in the order of 7 to 1 using air as the source of heat. Where favorable conditions exist with low-cost water at 50°F. or over, very high performance factors can be expected with corresponding low costs. Outside temperatures, in this case, do not reduce the plant capacity in cold weather, as in the case of using air as the heat source. We have good reasons to believe a coefficient of performance of 4 to 1 has been obtained as an over-all nine-year seasonal record from our San Bernardino office installation.

"The cost of electric service for heating with reverse-cycle system, giving equivalent results, will usually be in the order of 20% to 30% of the cost with direct resistance type heating. This cost factor will depend on the over-all coefficient of performance, load factor, and rate schedules applicable to the job, etc. This reduced cost of operation immediately places it in direct economic competition with gas, oil, or any other type of fuel and opens up a broad market which heretofore was not easily sold. The consumer is rightly cost conscious and reverse-cycle air conditioning now offers us a tool to sell this market on at least an even basis."

Operating Data

Four heat-pump installations, made in Southern California Edison Co. district offices, have been in service long enough to obtain some reliable operating information. Table III shows salient features of the building and the air-conditioning plant for each job, together with operating and cost figures.

The Edison Co. makes the following comments on the data: "Item 16, Table III, involves tests, made by California Institute of Technology students under limited company cooperation. These were conducted under rather adverse circumstances. Both Whittier and Santa Ana were made in very moderate weather and machine was consequently on line only a short time. Therefore, the results of 7.35 for Whittier and 1.5 for Santa Ana are questionable. The Montebello test of 3.81 at 51°F. is in line with probable expectation. The San Bernardino test of 2.04 at 46°F. looks low. Calculations hereinafter given for the actual over-all average annual C.O.P. indicate something in the order of 4.0."

There are no demand meters on these installations. Demands (and resultant load factors) are based on observed demand by counted rpm of watt-hour meter disk under full load conditions.

It is of interest to note that the average power cost, calculated on our regular retail power schedule, averages considerably under 1c per cu.ft. per year for all-year-round air conditioning.

Fairly complete operating data are fortunately avilable for the San Bernardino office, affording what is in reality a "before and after" test.

The building, originally constructed in 1927, and first occupied in September, is 129 ft. long and 33 ft. wide (inside) with 16-ft. ceiling. Walls are 12-in. concrete plastered on the inside. The ceiling was insulated with ½-in. celotex as a plaster base.

The building was originally heated by electric wall-type heaters equipped with automatic temperature control by zones. The total heating capacity installed was 69 kw., all of which was required in cold weather. An additional 3-kw. portable-type heater was used at times at the west (front end of office) during severe weather conditions (total connected 72 kw.).

During 1937, the building was remodeled as follows: In the rear 43 ft. of the building, the walls and top ceiling were raised approximately 4 ft. This new ceiling was insulated with 2-in. mineral wool. This alteration provided approximately 5,700 cu.ft. more working space, or a total of 73,800 cu.ft. to be air conditioned; two large skylights in the front office were closed up and plastered over, flush with the ceiling; 100 sq.ft. more windows were added in the rear of the building; lighting was increased from approximately 12 kw. to 22 kw. to provide for an office staff which had increased from 15 to 30 employees.

Year-round air conditioning (with heat pump) was installed at this time, utilizing both time and temperature control, a 10-hp. compressor and a 2-hp. fan on each of the evaporator and condenser coils. Cooling capacity was essential because of the extremely hot weather, increased lighting load, and added personnel. In winter, on heating operation, the unit has satisfactorily replaced electric heating and reduced maximum demands from 72 kw. to 13.85 kw. This would, on a comparative load basis, indicate a coefficient of performance in the order of 5 to 1. This, however, is not exactly true because of increased lighting load, increased occupancy and minor changes in the heat loss of the building.

Climactic conditions during the two periods were practically identical. For the direct heat period there were 41,246 degree-hours and for the heat pump period there were 40,413 degree-hours.

A summary of before-and-after data appears in Table IV. The coefficient of performance of 3.68 is obtained by charging all lighting load in heating seasons to the heating. If half the lighting load is so charged, the C.O.P. becomes 4.28.

So far, good year-round data on residential installations, properly correlated with accompanying climatic data, have not been accumulated for the commercially available units on any significant scale.

Pending the assembly of such information, however, utility men may, from the information presented herein, together with their own information on local rates and local heating requirements, form a fair estimate of heat-pump potentialities on their systems.

They may also arrive at the price for which a heat pump would have to sell to be the best *and cheapest* method of heating most residences in their areas right now.

At present, most heat pumps are being sold as air conditioners, with the heating feature as an added attraction —which is to say with the free heat calculated as a reduction in the net cost of summer cooling.

It is not unreasonable, however, to anticipate a day when summer cooling may be the added attraction to a device sold basically as a clean, safe, healthful, efficient way of providing homes and buildings with low-cost heat.

Table III—Data on Heat Pumps in Southern California Edison Co. District Offices

Item	Whittier	San Bernardino	Montebello	Santa Ana
1. Date put in service	March 1937	June 1937	June 1938	Sept. 1940
2. Cubic feet conditioned area in building	75,300	73,800	50,100	116,700
3. Number of floors in building	One	One+Mezz.	One	Two
4. Calculated heating load—if direct electric heat	47 kw.	79 kw.	72 kw.	88 kw.
5. Tons of refrigeration installed—Reverse cycle	10	10	10	15
6. Number of compressors	1	1	1	2
7. Hp. of compressor motor(s)	10	10	10	15
8. Hp. of fans (2)	5	4	4	10
9. Rated capacity C.F.M. outside air	6,240	....	4,180	18,000
10. Rated capacity C.F.M. conditioned air	4,740	4,090	4,180	12,000
11. Main source of heat	Air	Air	Air	Air
12. Supplemental source of heat	None	Water	Water	Water
13. How accomplished	....	Spray Heads	Fin Coil	Evap. Cond.
14. Frost prevention on evaporator coil	None	Preheat Spray	Preheat Coil	Evap. Cond.
15. Provision for defrosting	None	None	None	Evap. Cond.
16. California Institute of Technology—Test of C.O.P.	7.35	2.04	3.81	1.5
17. Made at O.D. Temp. of	63° F.	46° F.	51° F.	71° F.
18. Av. Annual operating kwh.-yr.-round air conditioning	24,096	38,900	25,667	52,326
19. Maximum demand—observed as of record	11.5 kw.	13.85 kw.	14.4 kw.	21.9 kw.
20. Av. Annual load factor—year-round air conditioning	24%	32.05%	20.2%	27.4%
21. Av. Annual kwh. chargeable to heating	7,996	11,440	8,556	21,800
22. Av. Annual load factor—heating only	7.94%	9.42%	6.75%	11.35%
23. Av. Annual kwh. chargeable to cooling	16,100	27,460	17,111	30,526
24. Av. Annual load factor—cooling only	15.88%	22.63%	13.5%	15.95%
25. Av. Monthly kwh. for 3 cold months (Dec., Jan., Feb.)	1,648	2,363	1,717	4,531
26. Av. Monthly kwh. for 3 hot months (July, Aug., Sept.)	2,742	4,546	3,314	5,071
27. Av. Annual kwh. per cu.ft.—heating	0.106	0.155	0.171	0.187
28. Av. Annual kwh. per cu.ft.—cooling	0.212	0.372	0.342	0.262
29. Av. Annual kwh. per cu.ft.—yr.-round air conditioning	0.318	0.527	0.513	0.449
30. Annual cost of power for operation—yr.-round air conditioning	$531.00	$672.00	$530.00	$901.00
31. Annual cost of power for operation—per cu.ft.	0.71c	0.91c	1.06c	0.77c
32. Approximate installation cost	$5,500	$5,400	$6,500	$8,900
33. Installation cost per cu.ft. of conditioned space	22.9c	14.6c	25.3c	17.0c

Table IV—San Bernardino District Office, Before and After Heat Pump

Item	Original Building Direct Electric Heating	Remodeled Building Reverse Cycle Air Conditioning
Years in service	9-2/3	9¾
Connected load	72 kw.	14 hp.
Maximum demand	72 kw.	13.85 kw.
Average annual kwh. used for heat	54,234	11,440
Comparative annual load factor (heating only)	8.6%	9.42%
Mean heating requirements degree-hrs. for period	41,246	40,413
Apparent performance factor of heat pump from:		
a. Comparison of max. dem. (Item 3 above)		5.19/1
b. Comparison of kwh. used (Item 4 above)		4.75/1
c. Calculated C.O.P. (Minimum)		3.68/1
Average annual kwh. used for cooling		27,460
Average annual kwh. for both cooling and heating		38,900
Average annual load factor for year-round air conditioning		32%

Shop talk between sessions at Portland. (Front to back) Siegfried, Setterstrom, Kirk

A YEAR OF DESIGNING, BUILDING, OPERATING DISCUSSED AT N.W. MEET

R. J. Davidson, section chairman, and James H. Polhemus, association president

DESPITE the fact that Northwest engineers are hard at work on record programs, the necessity for taking time out to profit from the lessons learned resulted in 215 of them showing up at the Multnomah Hotel, Portland, April 9-11. The occasion was the annual meeting of the Engineering and Operation Section, Northwest Electric Light and Power Assn., and the attendance was the largest for many years.

Association President James H. Polhemus, who is also president of Portland General Electric Co., read an address of welcome, and Section Chairman R. J. Davidson, Northwestern Electric Co., quickly launched the meeting into a full schedule of technical discussions. As one of the committee chairmen, Joe Hellenthal, Puget Sound Power and Light Co., later observed, the two and a half days of meetings were barely enough to scratch the surface of accumulated problems.

There were two outside speakers. H. E. Kent, director of engineering for Edison Electric Institute, reported on the extensive engineering activities now being carried on by EEI. Gen. T. M. Robins, U. S. Army Engineers, retired and now doing consulting engineering in Portland, spoke on Columbia River power development. A large, attentive and favorably impressed audience heard his argument for regional development, the burden of which is indicated by the following extracts:

"It must be recognized by each and everyone that power development in the Pacific Northwest faces two serious problems. The first problem is to convince Congress that failure to make adequate appropriations at this time for multiple-purpose projects under construction on the Columbia River system, and for the backbone transmission lines to implement the power features of these projects, will weaken the regional economy of the Pacific Northwest to a degree which the nation as a whole cannot afford. The other problem is to see to it that no radical change is made in the part that government plays in promoting economic growth of the Pacific Northwest. No matter how difficult it may be at times to secure appropriations, development of our natural resources should continue under our present system of representative government without the stifling of private initiative and enterprise which is the premeditated, but unavowed, objective of the proponents of a Columbia Valley Authority.

"There is no legitimate need for establishment of any more 'valley authorities' in this country. Existing laws and procedure provide for full coordination between competent federal agencies now engaged in adequate programs for development of our natural resources under a sound federal policy. This policy fully protects the rights of the states in determining the development of watersheds within their borders and likewise the rights of individuals in the use of their lives, their land and their water. We need development, but not regimentation. Most serious considerations should be given by all the people of any region to the consequences before giving up the protection of their rights under existing law and subjecting themselves to an authority unencumbered by any of the

restraints that a republic should erect against agencies of government . . .

"Most of the agitation and arguments that have arisen, and persist, over the disposal of power from federal multiple-purpose projects could be done away with if the laws enacted by Congress were interpreted and administered with reason and tolerance. No one can object to the policy of giving preferential status to public bodies and cooperatives, nor to affording the people within economic transmission distance reasonable opportunity and time to take any action necessary to create such public bodies and cooperatives under state laws and arrange for financing. On the other hand, if the people elect to be served by privately owned companies, those companies have a right to purchase power generated at federal projects without the imposition of discriminating rates and unreasonable contract provisions with a view to putting all privately owned utilities out of business. It is the intent of Congress that the people, not the bureaucrats, shall determine how they shall be served with electricity."

Gen. Robins predicted that the 2,300,000 kw. of new hydro generating capacity involved in engineer and reclamation projects already undertaken are vital to keeping low-rate power widely available in the area. He pointed out that this forthcoming capacity will need transmission, for which provision has not been made to date. To guarantee the construction of such transmission in time, he believes, requires among other things that Bonneville Power Administration eliminate line projects which are not a part of backbone transmission.

Utilization

The Utilization Committee's chairman, John Bankus, Portland General Electric, called first on Marshall Blair, WWP, who led a discussion of reactive kva. in Northwest power pool operation. Blair pointed out that there is no spare prime mover capacity in the pool at peak times; hence generators cannot be used to supply reactive kva. Correction for this year and next will have to come mostly from capacitors on 2,300- and 4,000-volt feeders. Synchronous condensers would of course be fine, but could not be obtained within three years.

He warned that if correction by capacitors is not made there is going to be an actual loss of kilowatt load.

Bankus stated that the relative cost of capacitors favors their use today. Capacitor costs have held, while other equipment costs have averaged a 30% increase in the last five years.

Corbett McLean, Northwestern Electric, carried along the capacitor theme with a discussion of their application to customer loads. The place for a capacitor, he emphasized, is at the load center.

Paul R. Oldenberg, Pacific Power & Light, said his system is installing 19,000 kva. this year and conducting a campaign to encourage customers to self-correct

F. H. Ferguson, Puget Sound P & L says plans involve 30,000 kva., and studies are under way concerning addition of 30,000-kva. blocks beside synchronous condensers.

R. S. Daniels, California Oregon Power, said his company is without a rate favoring high power factor, but that some saw mills have installed capacitors nevertheless.

R. C. Setterstrom, Montana Power, pointed out that synchronous equipment of their largest customers, Milwaukee RR and Anaconda Copper, helped the total system picture considerably. Law allows them to refuse to serve low power-factor loads, but they prefer to use a sales approach to secure voluntary improvement. Wiring savings frequently justify a customer in adding capacitors.

He reported cases where improperly operated synchronous motors were actually running lagging at 70%. He suggested that such cases offered an opportunity to get capacitance at no cost. C. E. Cannon, WWP, said his system has found the same thing.

Bankus said Westinghouse' network analyzer at E. Pittsburgh will be used to determine the locations and amounts of capacitance to be applied to the Portland General Electric system.

C. W. Jarrett, Portland General Electric, centered his remarks about new street lighting equipment around mercury vapor lamps. Jarrett conducted his own public opinion survey in Denver, early this year. Denver started its mercury-vapor conversion in 1942. He found everyone he talked to favorable—his sample including a large variety of merchants.

Carl Spain, Westinghouse, showed that company's first-class sound-color film on principles and production applications of induction and dielectric heating.

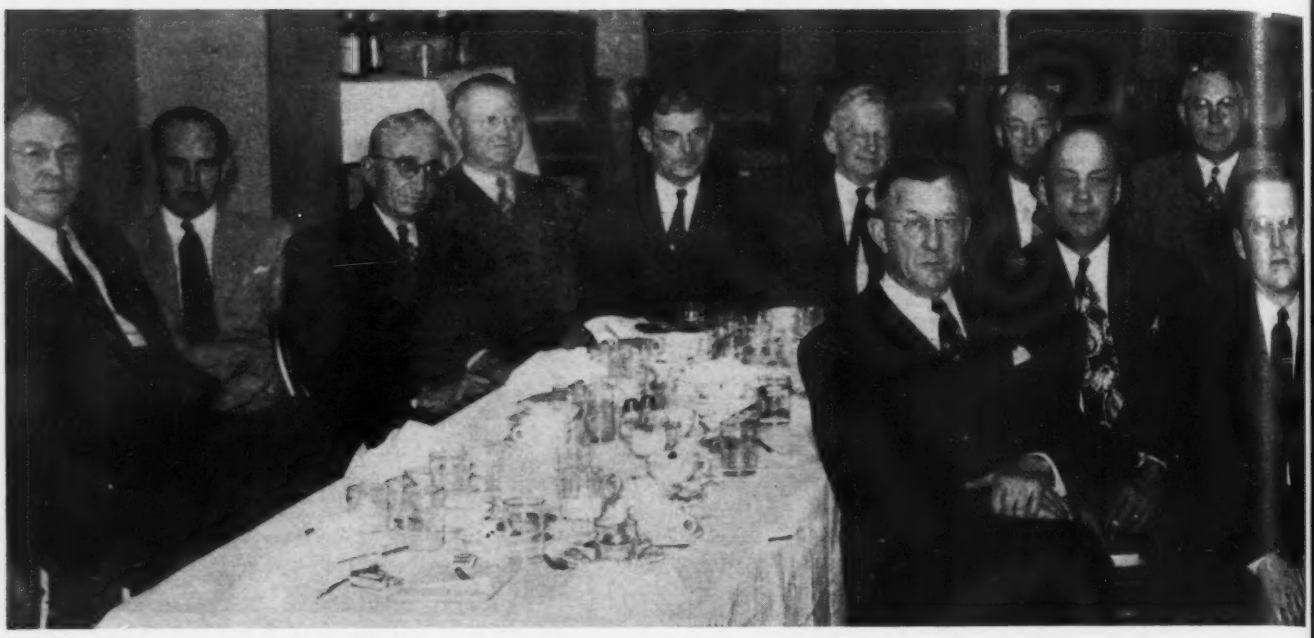
Transmission and Distribution

C. H. Kirk, Montana Power, heading the transmission and distribution committee, first introduced Harry M. Jones, Idaho Power, who discussed contract work.

Jones reported that a prewar experiment on an informal basis indicated lower costs on contract work. Since resumption in 1945, contract work now aggregates 360 mi. of line for which costs have been 108.6% of estimate—the estimate not including general overhead costs.

Full-Year Data on Electric House Heating, Compiled by Portland General Electric Co.

	February 1946	March 1946	April 1946	May 1946	June 1946	July 1946	August 1946	Sept. 1946	Oct. 1946	Nov. 1946	Dec. 1946	Jan. 1947	Feb. 1947
Normal Degree Days—U.S.W.B.	622	530	370	241	107	29	29	109	298	540	729	775	4,379
Actual Degree Days	567	541	368	137	119	21	24	95	389	588	656	803	4,308
Monthly Minimum Temperature—°F	31	33	35	45	50	52	52	43	35	30	27	22	22
Number of Houses Under Test													
Central Furnaces	22	19	20	20	22	21	21	20	22	21	21	21	21
Unit Heaters	31	31	29	27	29	29	29	26	27	26	28	27	28
Average Cubical Content per House													
Central Furnaces	10,311	10,694	10,401	10,450	10,310	10,245	10,325	10,312	10,311	10,397	10,397	10,435	10,382
Unit Heaters	10,058	10,077	10,425	10,079	10,091	10,102	10,181	9,998	9,857	9,744	10,209	10,163	10,082
Average Connected Heating Load—KW													
Central Furnaces	16.5	16.6	16.8	17.0	16.5	16.4	16.4	16.4	16.0	16.2	16.2	16.0	16.4
Unit Heaters	15.3	15.2	15.2	15.5	15.3	15.4	15.5	15.3	14.5	14.5	15.4	15.8	15.3
Average Number KW—Hrs. per House													
Central Furnaces	2,310	2,006	1,608	465	343	90	35	348	1,447	2,297	2,480	3,350	16,779
Unit Heaters	1,783	1,498	1,236	328	294	76	40	296	998	1,806	1,922	2,763	13,040
KWH. / Degree Day / 1000 Cubic Feet													
Central Furnaces	0.395	0.347	0.420	0.325	0.279	0.416	0.142	0.355	0.361	0.376	0.364	0.400	0.375
Unit Heaters	0.313	0.276	0.322	0.238	0.245	0.361	0.164	0.312	0.260	0.315	0.287	0.339	0.300
Average Max. Coincident Demand—KW													
Central Furnaces	8.9	9.4	9.1	6.7	4.0	2.0	1.1	5.9	8.6	9.2	8.8	9.5	9.5
Unit Heaters	6.0	5.4	5.1	3.1	2.3	0.7	0.5	2.7	5.3	5.6	6.6	7.7	7.7
Average Max. Non-Coincident Demand													
Central Furnaces	11.4	11.5	12.4	11.6	11.2	8.4	4.6	11.7	11.7	12.0	11.0	12.3	12.4
Unit Heaters	10.0	9.0	8.6	6.1	5.4	3.4	2.3	6.4	8.5	9.5	9.7	10.9	10.9
Average Coincident Demand on System Critical Period													
Central Furnaces	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	3.8	5.8	5.8	6.7	
Unit Heaters	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	3.6	4.6	4.6	5.1	



Northwest Association Engineering Executive Committee and guests: (1) Joe Henkle, Portland General Electric; (2) Wayne Snowden, Electrical West; (3) Howard Jones, Idaho Power; (4) Joe Hellenthal, Puget Sound P&L; (5) E. H. Collins, WWP; (6) Berkeley Snow, association executive secretary; (7) George Sullivan, Portland General Electric; (8) H. H. Schoolfield, Pacific P&L; (9) A. L. Pollard, Puget Sound P&L; (10) Association President James H. Polhemus, Portland General Electric; (11) T. E. Roach, Northwestern Electric; (12) R. S. Daniels, California Oregon Power; (13) Section Chairman, R. J. Davidson, Northwestern Electric; (14) Joe Siegfried, Pacific P&L; (15) H. E. Kent, Edison Electric Institute; (16) G. McClellan, Mountain States Power; (17) Charles Osborne, Portland General Electric; (18) J. H. Steede, British Columbia Electric Railway; (19) O. L. LeFever, Northwestern Electric; (20) Magnus Crawford, Puget Sound P&L; (21) C. H. Kirk, Montana Power; (22) John Bankus, Portland Gen. Elec.

This work was performed on simple contract, usually awarded without general competitive bidding. Small contractors have done the best. Split bids are a convenient feature, allowing the contractor to pull out and collect for the completed portion of the job if material shortage forces a work stoppage. Some cost-plus work has also been tried, seldom with good results—costs almost always have exceeded estimates.

Setterstrom reported on various contractual arrangements which have been used in Montana. He generally agreed with Jones. He considers proper utility planning, scheduling and supervision to be an important requisite of successful contract work.

Earl Baughn, WWP, said his system, to the contrary, has used cost-plus extensively, after providing the contractor with the company's cost estimate as a target. Fair profit for the contractor is usually considered to be 8%-10%.

Kirk pointed out an interesting psychology which leads contractors to up prices on transmission. He described an incident wherein after convincing a contractor that a 50-mi., 55-kv. transmission line was nothing but "a big, rural line," Montana Power got him to submit a bid which led to construction of the line for a price below company costs, and at a profit for him.

C. L. Brown, Pacific P & L, reported on practices of various systems throughout the country in washing hot insulators and bushings.

D. F. Misz, Puget Sound P & L, led a discussion of series capacitors. Conclusion from the experiences of numerous companies: these work fine where they are closely matched to the requirement, but bring trouble if load conditions change.

Baughn described two WWP transformer-rack designs. These schemes have the virtue of extreme simplicity, which is at special premium today.

Howard Arnett, Portland General Electric, led a discussion of limiters on underground networks. The limiters, a Burndy product, are on order, and installation following the very extensive NY Consolidated Edison practice is contemplated.

Ferguson said the complete network in Seattle (designed in the early '20's by M. T. Crawford) has functioned very satisfactorily, that limiter experience is being watched, but that at present none are scheduled.

Ferguson also conducted the discussion of non-leaded underground cables. He pointed out that lead shortages may well force extensive use of such types, that some unions have evidently anticipated this by including in contracts the specification that non-leaded as well as leaded cable be spliced only by journeymen splicers. He read C. F. Myers statement of Puget Sound P&L experience with non-leaded cable for underground distribution (see page 71).

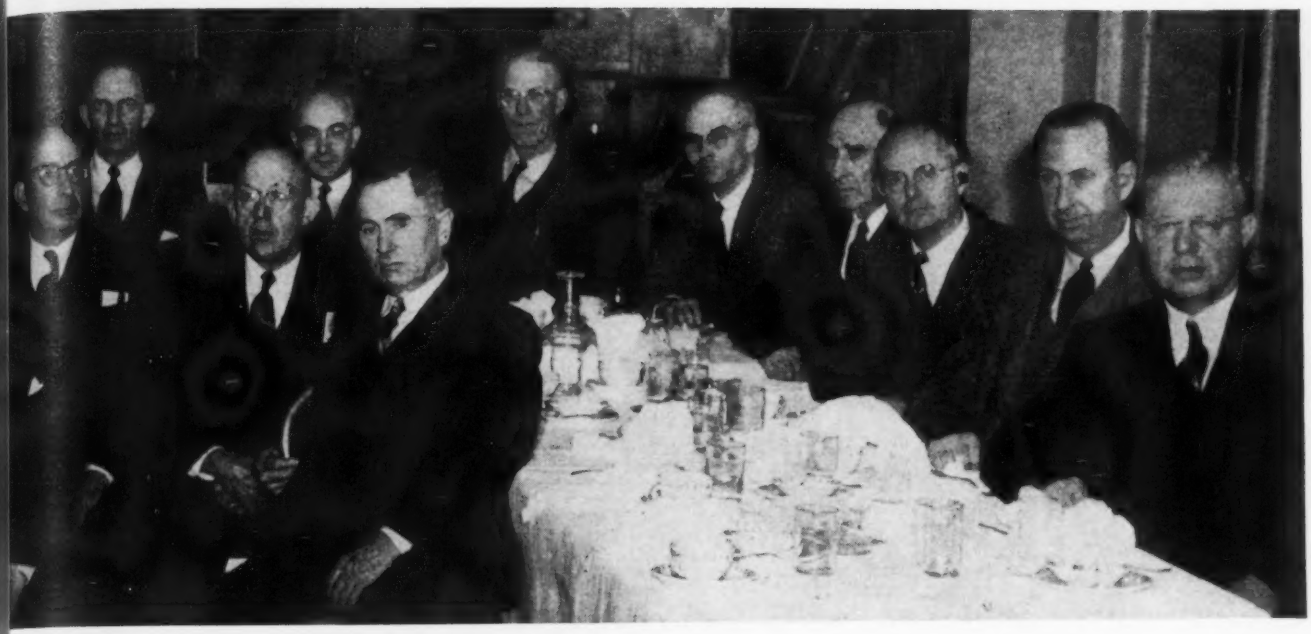
Electrical Equipment

Capacitors again came into the picture in electrical equipment committee discussions; Hellenthal heads this committee. This time, McLean discussed large banks on feeders. Northwestern Electric has some form of switching arrangement on all banks, is looking forward to the need for automatic switching.

Cannon said WWP experience is similar, that when total capacitance exceeds the 60,000 kva. now planned, WWP will also confront the need for automatic switching. WWP banks are 4,000 kva. or smaller. They are fused in small blocks, for example 180-kva. blocks on 2,400-volt feeders, fused at 150% of normal capacitor current.

Puget Sound plans three 30,000-kva. banks supplementing three synchronous condensers. Each will be split into 10,000-kva. blocks for switching.

P. H. Light, General Electric Co., discussed fundamentals of switched capacitors, covering total capacity which can feasibly be added to a given system, and total which can feasibly be switched as a block. As to switching,



he pointed out that inrush current is not critical and that serious difficulties in breaking are usually not encountered up to 10,000 kva.

R. P. Martell, Puget Sound P & L, reported on the modernization of more than 50 69-kv. circuit breakers to speed up operation and increase interrupting capacity. Records on modernizing three different makes revealed costs of 28%, 30% and 48% the cost of new breakers at the time of modernization.

Cannon reported that WWP has an extensive program under way with costs estimated at 40% of new breakers. Bankus said Portland General Electric is modernizing without rebuilding, which is to say, purchasing new breakers for points of high load concentrations and relocating older types where duty is less severe.

Otis Keeler, Westinghouse, pointed out that the particular location of a breaker has an effect on what the breaker will interrupt, especially recovery voltage, and that systems should therefore be cautious in exceeding manufacturers' guarantees on the basis of a limited test.

Cannon started off the discussion of transformer fusing in the 55- to 115-kv. range, reporting results of a questionnaire he had sent to member companies. General practice is to fuse only for fault protection. About half the systems reported fusing up to 10,000-kva. banks, half to 6,000 kva. Two systems reported 15,000 kva. In general, operating experience has been satisfactory.

Steede of B.C. Electric, had remedied fuse link corrosion troubles by dipping parts in neoprene.

A. D. Morris of Portland General Electric described experience with a 2,500-kva. portable substation.

Electronics

The newly formed Electronics Subcommittee, W. A. Leidigh, Jr., Portland General Electric, chairman, started off with the subject, supervisory control, headed by L. G. Walker, Idaho Power. Three northwest systems have supervisory equipment in or on order. Idaho Power expects equipment in August this year to handle 65 points of control initially, with a capability of 120. Eventual control distances will be up to 70 mi.

Utility radio was the subject of a panel discussion. W. L. Campbell, Northwestern Electric, described cases of signal confusion and steps taken to overcome it (see page 70).

H. M. Lewis, California Oregon Power said their experience with ultra-high-frequency FM has been excellent, that line-of-sight rules do not always prevail, good reception frequently occurring behind mountains.

A. A. Noon, Puget Sound P & L, reported that radio has been used very successfully on a lot of special jobs—pulling up long spans, etc. His system is embarked on a program of equipping 50 cars.

Leidigh presented a paper on progress with 30 and 70 megacycle tests, and Portland General Electric's 75.5 megacycle units (to be published).

Walker described a carrier set, not intended to supplant radio, which is an 0.2-watt outfit in a "cigar box," which is used in connection with coupling equipment on a hot stick, enabling linemen in Idaho to talk over the distribution lines and up to 22 kv.

The paper of R. E. Kistler, Pac. Tel. & Tel., "Commercial Rural Telephone Service by Power Line Carrier," was published in ELECTRICAL WEST, April 1947.

Meters and Services

C. S. Alger, heading the reconstituted meters and services subcommittee, had just queried Westinghouse on the meter socket situation, quoted them as reporting present production at 42,000 units per week. This is sufficient to match combined national meter production but allows no margin for catching up on installations made without sockets.

Demand meters maintenance and testing discussions revealed that ex-

perience with these in the Northwest is very limited.

A. D. Morris, Portland General Electric, summarized practice in metering house heating loads. Loads up to 10 kw. use a 15-amp. watt-hour meter. At higher loads, combination meters are employed. The system has more than 1,800 connections in these various categories.

Code

A brief program by the code committee, with M. T. Crawford, Puget Sound P & L, presiding, consisted principally of a resume of the national status quo by H. E. Kent of the Edison Electric Institute, N. Y. Crawford reported on studies aimed at rewriting the code to prevent motor burnouts arising from single-phasing which in turn is caused by an ungrounded primary on a Y-delta transformer bank. He asked for submission of any case histories which members may have, as the committee is attempting to study as many instances of burnout as can be accumulated.

House Heating

Chairman O. L. LeFever, house heating engineering research committee, called first on A. E. Opdenweyer, Portland General Electric, who reported that data collected this winter tend to confirm earlier findings. Results are tabulated in detail on page 67.

Both WWP and Puget Sound P & L are accumulating data, but their studies do not yet cover a full heating season. Alger said Puget Sound is setting up their data, as accumulated, on IBM cards to simplify future tabulation and analysis.

Power Production

Chairman A. L. Pollard conducted the power production committee program. E. H. Collins, WWP, spoke on dam repair and maintenance, reviewing methods in use as gunite, pre-fab concrete, earth and rip-rap blankets, surface coloring, etc.

J. F. Spease, General Electric, discussed concrete growth and alignment problems, citing the difficulty of reaching conclusions because of lack of data. This often prevents determining, for example, whether a misalignment has resulted from one part's rising or from another's sinking. Numerous examples of strange shifts in concrete were reported, but the discussion threw no light on any uniform cause.

Collins pointed out, however, that study of so-called "growth" in several locations throughout the country has led to the tentative conclusion that certain aggregates in combination with certain cements lead to dimension changes after several years. Collins felt that until further evidence comes to light the best precaution is to make certain of aggregate quality, even if this entails extra expense. He said the troublesome aggregates are so far known to have appeared only in the region east of the Cascades, west of the Mississippi, and extending south as far as southern California. Walter Brenton, Portland General Electric, reported on prospects of the power pool for meeting this winter's loads. He characterized the situation as "very tight." Pool estimates show a possible shortage at winter peak amounting to 200 megawatts. This is computed on a critical water year. Normal water would improve average capacity by 60 megawatts.* If Bonneville Dam were to raise water to wartime operating level, 37 more would be gained. Another 50 can be picked up from municipal steam plants not counted as part of the pool generating resources. Another factor is that aluminum plant loads aggregate 600 megawatts and presumably might be reduced in emergency. Daylight saving or power from naval vessels might be resorted to. System capacitor additions will contribute. It appears probable that the pool can squeeze through the winter with existing facilities.

* See snow survey, page 72.

Campbell's Report - Radio Signal Confusion

Northwestern Electric Co., as early as 1916, officially entered the wireless communication field with the first two stations to be operated in the United States for load dispatching by an electric utility. From this stationary spark-gap transmitter, Northwestern has continued to pioneer and experiment in the development of radio as a means of bettering service. Last year the company selected a 250-watt FM transmitter and the necessary equipment to convert mobile units to FM. Licensed as KBPB and operating on a frequency of 39.86 megacycles, this station quickly proved the value of FM for emergency operation.

An extensive field check was made to obtain a suitable spot for our transmitting station where adequate line-of-sight coverage could be obtained. The top of Mt. Scott, elevation 1,081 ft., was selected. From here, we could get coverage up to 100 miles.

A Motorola unit of 250-watt output was installed. It is normally powered by a single-phase service and in case of the failure of the normal power supply will automatically throw over to a gasoline generator. A half-wave coaxial, vertical antenna is fed by a coaxial line using dry air for gas. The transmitting station is unattended, entirely automatic and controlled from our Albina substation, 10 mi. away over a channel leased from the telephone company. There are 37 2-way mobile units in our system, utilizing Motorola 30-watt transmitters with 13-tube dual-conversion receivers.

Upon conversion we had the usual minor troubles attending the installation of any new equipment. This installation was the first FM system in this territory to be used in the dispatching of emergency orders. Eventually we thought we had all the bugs ironed out and were serene in the thought that now we had the tops in a radio communication system.

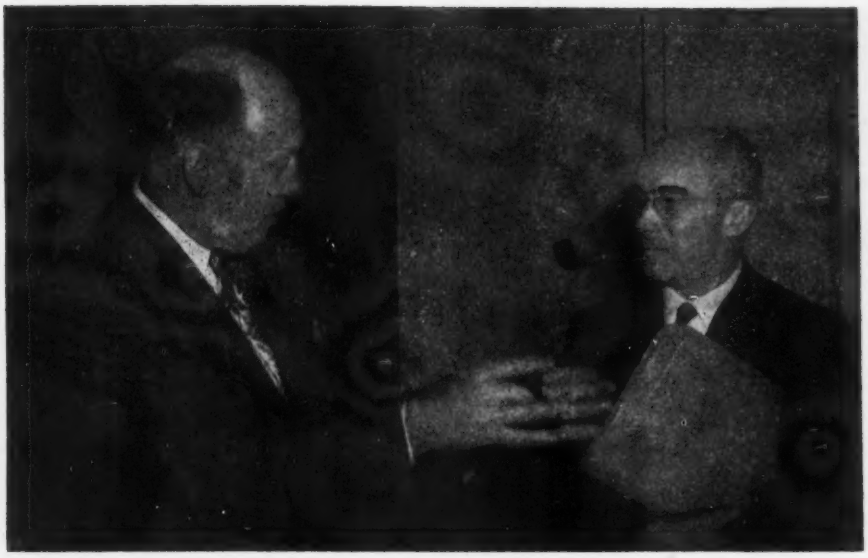
Our feeling of self-satisfaction was short-lived, however. Out of the clear blue, so to speak, we began to log stations and mobile units from all over the country. As an instance, we would call car 837. We would get an answer from our own car, and when our dispatcher would tell him that a pole was down on Jersey Street in St. Johns and to proceed there at once, back would come a voice telling him that he, the dispatcher, was crazy as a loon, and there was neither a Jersey Street nor a St. Johns in Richmond, Virginia, and besides who did he think he was ordering the Richmond Utility around like that.

We began getting calls telling us car number so and so was in service. They were not numbers which corresponded to ours and when the dispatcher would check back, he might find he was talking to New York, Birmingham or Kansas City. It reached the point where our dispatchers were almost afraid to go on the air during certain periods of the day. In several days they logged 64 stations on our frequency. We thought that perhaps the Federal Communications Commission had given the 39.86 megacycle wave length to the whole United States.

For five hours each day, our reception was a jumble of stations from all over the country. Something had to be done. Undoubtedly, reflective gaseous layers in the upper atmosphere caused this confusion.

After ascertaining that all the foreign signals were coming in from eastern stations we decided to try receiving the eastern signals on a beam antenna and feeding them against themselves coming in on the main antenna. Theoretically, if properly done this should cancel out the foreign signals. In order to do this, it was necessary to install a parasitic element of the reflector type. This mean

Hellenthal heads equipment committee



"Out West here we do it this way," says Pollard to EEI's engr. director, Kent

arrangement of an additional element to receive its power by induction or radiation from the antenna and reradiate it in the proper phase relation to achieve the desired effect.

The parasitic element is called a director when it reinforces radiation on a line pointing to it from the antenna, and a reflector when the reverse is the case. Whether the parasitic element is a director or reflector depends upon the parasitic element tuning (which is adjusted by changing its length) and, particularly when the element is self-resonant, upon the spacing between it and the antenna.

This was tried with fair success and most of the eastern signals, including signals radiated by local diathermy equipment, were eliminated. In doing this, however, we found that reflections of signals from our own cars, created locations where our car signals were themselves eliminated. In making these tests, a panoramic adapter was used. This permitted us to see the signals coming in and thus obtain a clearer idea of what we had to contend with. We found that signals as far away as 40 kilocycles on the spectrum interfered at times.

Our next step deviated from the usual practice of using one antenna for transmitting and receiving. We installed a separate antenna of the beam type for receiving only. As the entire territory we wish to cover with our network is west of our transmitting station and its antenna, we are in a particularly fortunate position for beaming. We used a three-element beam antenna with a front-to-back ratio of 30 decibels. A three-element beam antenna is obtained by using two parasitic elements, one as a reflector and the other as a director.

By the use of this combination, we were able to increase our forward gain by about six times over our coaxial antenna and at the same time cut down the eastern interference by 50%. With this forward gain favoring our own mobile units, we could tighten our squelch control to eliminate another 30% of the interference.

This came close to our objective of eliminating interference from eastern stations, but we still get an occasional one. We are now planning on using one or two more reflectors. We expect that this will broaden and strengthen our own receiving signal, give us a wider coverage in the territory we wish to cover and at the same time eliminate all our former interference. We do not expect to have any dead spots in our own reception.

Proper allocations of frequencies relative to station locations will be the real solution to our problem, but this can be done only by the FCC.

Myers' Report—Non-Leaded Underground

Prior to the war, on our Seattle underground system, we used paper-insulated lead-covered cable for 13-kv. and 4-kv. circuits and for secondary mains, and rubber-insulated lead-covered cable for services. For ornamental street lighting, it had been our practice, for many years, to use non-metallic, or "parkway" cable directly buried in the earth. For residential underground systems we had used paper-insulated lead-covered cable, usually protected by half tile or planking.

During the war, the lead shortage forced our initial use of synthetic rubber-insulated, synthetic-rubber-jacketed cable for our Seattle secondary network. To date, these installations have proved satisfactory, but the experience has not been of sufficient duration to warrant drawing definite conclusions. Since the paper-lead cable can be operated at higher temperatures, its use requires less duct space, which, in some cases, is important. We have no reason not to expect long life from the synthetic-rubber-insulated, synthetic-rubber-jacketed cable. Probably its chief disadvantage is that, under fault conditions, it emits a greater volume of combustible gases. In general, we believe that the choice between the two should be largely influenced by cost of the cable installed.

We are continuing to specify paper-lead cable for 4-kv. and 13-kv. circuits, although we would be inclined seriously to consider using shielded synthetic-rubber-insulated cable for 4-kv. circuits if an important price advantage should develop.

For ornamental street lighting and for underground residential distribution systems, we favor the synthetic-rubber-insulated, synthetic-rubber-jacketed cable run in "transite," or the equivalent, conduit, as such installations cost only about 10% more than "parkway" cable installations and should cost considerably less to maintain.

We now see very little application for "parkway" cable on our system. The few situations where conduit is not justified, such as residential districts where houses are widely spaced, and strictly parkway ornamental lighting, we are inclined to favor direct burial of synthetic-rubber-insulated, synthetic-rubber-jacketed cable instead of the old style "parkway" cable.

SNOW SURVEY FINDS SOUTH DRY, NORTHERN AREAS OK

R. A. Work and Paul A. Ewing

Western water supply prospects, as indicated by the results of April snow surveys, are much like those of a year ago, although generally not so favorable. Severe shortages appear likely in the Southwest, including parts of California and Nevada, as well as Arizona and New Mexico. However, a progressive improvement from south to north is indicated, and while southern Idaho and southern Oregon are in the shortage area, the Northwest generally will have ample water for both irrigation and hydroelectric power. A favorable situation is also in prospect for most areas east of Continental Divide, but widespread shortages will characterize Rio Grande basin.

The original service contemplated by the Division of Irrigation and Water Conservation (now the Federal Coordinating agency in snow survey work) was to farmers; the interests of a multitude of other water users has somewhat expanded the objective. Two of the most important of these demands call for progressive volumetric runoff forecasts during the winter and early spring months in order to regulate flood-control works to best advantage, and water-supply forecasting for power generation. The latter service is especially important in such situations as that of the Northwest, where interconnection between power systems is so extensive.

Power resources of the major utilities of the Pacific Northwest are pooled and power interchange (from areas of power surplus to areas of power shortage) is planned months in advance. Advance planning is imperative to effect most economical power generation and negotiation of advantageous contracts for power interchange. Stream flow forecasts based on snow surveys greatly aid such planning and help in making possible maximum efficient use of available water power. Total generating capacity in the Northwest now exceeds 4,000,000 kw. distributed among 294 generating plants. Eighty-eight per cent of the total generation is by hydro plants. It is natural then that water operators are vitally concerned with knowing how much water is to be available each season. Snow surveys provide a clue.

Snow surveys have been used by the Washington Water Power Co. since 1927, as a means of directing operation of the Chelan plant, a 57,000-kw. hydroelectric generating station on Chelan River.

Storage capacity of the reservoir (Lake Chelan) supplying Chelan plant, is relatively large (678,000 acre-ft.), but maximum elevation of lake level is set by agreement. Therefore, lake storage must be manipulated between hard and fast upper and lower limits. Since total water supply often is not sufficient to run Chelan plant at full capacity for the entire season, careful programming of its operation, in relation to other hydro or steam plants of the system, is required.

In years of minimum snowfall a large proportion of the runoff to Lake Chelan is required to refill the reservoir to maximum permissible capacity. If low runoff is indicated by the snow survey, the load carried by Chelan plant in the spring is transferred to some other plant to insure filling the reservoir.

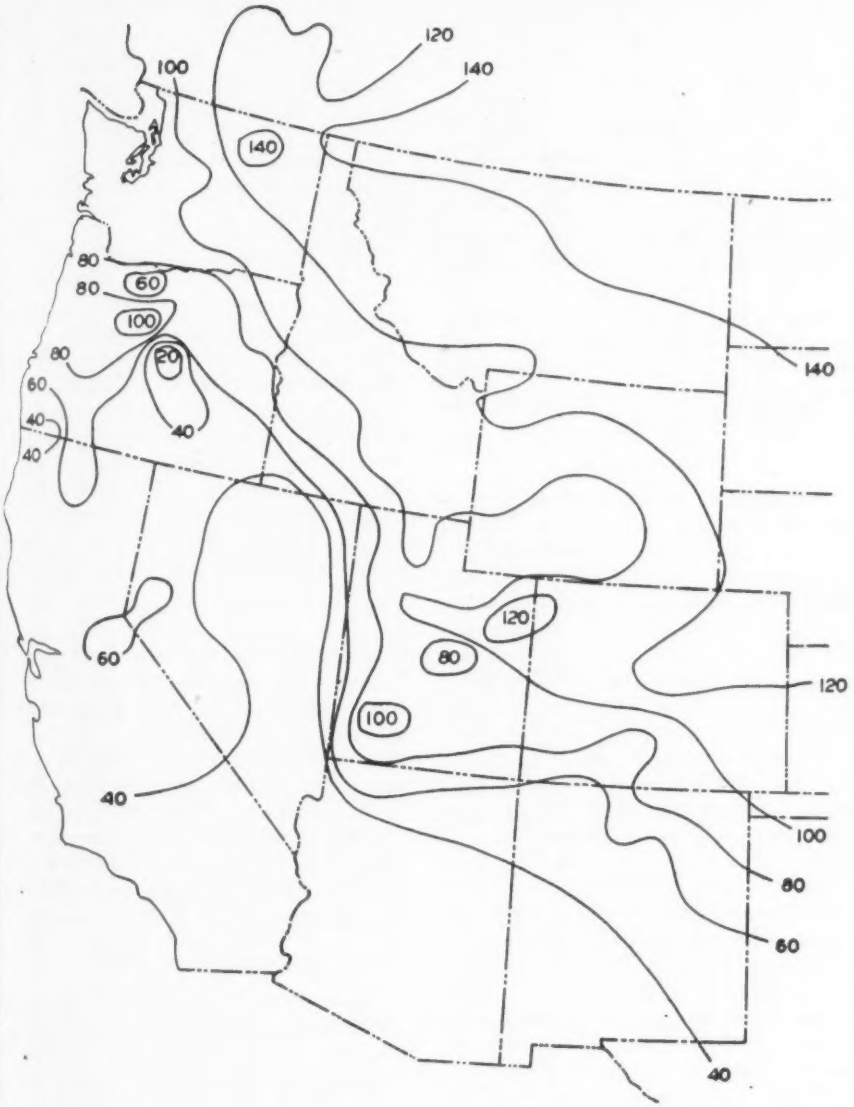
In years of maximum snowfall, with resultant high inflow, it is important to discharge surplus water at a minimum uniform rate throughout the lake-filling period to avoid damaging concentrations of waste discharge, but at the same time to fill the reservoir to upper permissible limit. Snow surveys furnish the data for this planning and operation, enabling predetermination of discharge rate to dispose of surplus water without risking failure to fill the reservoir. Each foot of depth the reservoir might fall short of filling is valued by the company at $25,000. Forecasts made from snow surveys have been 97% correct or better for the last seven years. By such accuracy, maximum use of available water has been made possible and considerable saving to this company has resulted.

Lake Tahoe, California, presents a similar illustration of the value of snow surveys. An upper limit of lake storage not to be exceeded is stipulated by court decree, but if not enough water is wasted from the lake before peak inflow occurs, rate of inflow to the lake may exceed spillway capacity. Excess lake storage and con-

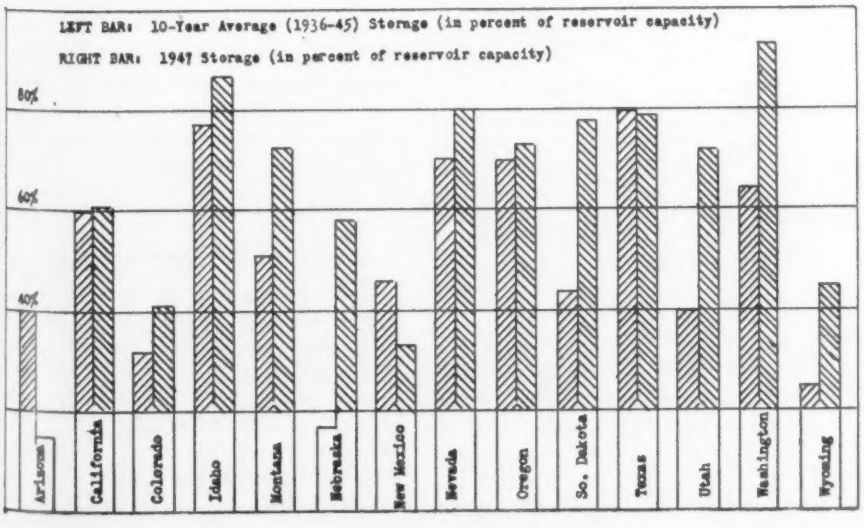
R. A. Work is senior irrigation engineer and *Paul A. Ewing* is senior irrigation economist, both of the U. S. Soil Conservation Service.

Predicted April-September Stream Flow

(Figures are percent of 1936-45 average)



Storage Situation in Western Reservoirs



sequent damage suits against the water users result in such a case. If too much water be wasted from the lake early in the runoff season, the lake might not fill. If the lake should not fill, each foot water depth below maximum permissible gage height represents cash loss of approximately $250,000 to power and agricultural water users on the Truckee River. Snow surveys have, therefore, been used for many years to gage in advance very precisely the level to which Lake Tahoe may be expected to fill, and the exact amount of water that should be wasted to prepare for the peak filling period.

Approximately 48% of potential water horsepower still undeveloped in the United States is in Washington, Oregon, Idaho, and California. As sources of power are developed and flow of Western streams becomes more fully used for this purpose, there will be even greater need than at present for snow surveys and water supply forecasts.

Prospects for 1947

The following paragraphs summarize the April forecasts, state by state, in arrangement similar to that followed by ELECTRICAL WEST in May 1946 and May 1945. These forecasts are based on the snow surveys conducted by the Division of Irrigation and Water Conservation, U. S. Soil Conservation Service, and its many cooperators. The two charts further summarize results of the April surveys.

Arizona

An acute shortage of water is imminent throughout the major irrigated areas. The winter snow-water crop was very short, record lows being recorded for most snow-survey courses. This shortage, coupled with general below-normal precipitation, will produce abnormally low runoff during the irrigation season. Reservoir storage is near an all-time low for April 1, being only 15% of total capacity. (The 1936-45 average was 40% of capacity.) Storage in Lake Mead (behind Boulder Dam) has declined to 59% of capacity from the 1936-45 average of 72%.

California

A general shortage is in prospect, the full natural April 1-July 31 stream flow of snow-fed mountain streams being forecast by the California Cooperative Snow surveys, in proportions of the 1936-45 means is from 28% for Kern River at Bakersfield to 68% for Sacramento River at Shasta Dam. Other principal Sierra streams show the following prospective runoffs: Kaweah River at Three Rivers, 41%; Kings at Piedra, 50%; San

Joaquin at Friant, 54%; Merced at Exchequer, 51%; Tuolumne at La Grange, 55%; Stanislaus at Melones Dam, 60%; Mokelumne at Mokelumne Hill, 61%; American at Fairoaks, 51%; Yuba at Smartsville, 54%; Feather at Oroville, 53%. The over-all picture may thus be said to promise about a 50% year. However, 24 reservoirs having a total capacity of 2,869,000 acre-ft. of water, are holding 1,742,000 acre-ft., or 61% of capacity. The averge storage in the 1936-45 period was slightly less than this amount, or 60% of total capacity. Three major reservoirs not included in the 24 have been in operation since 1943. They are: Narrows, capacity 43,000 acre-ft.; Friant, 436,500, and Shasta, 3,714,000. On April 1 the total storage in the 27 reservoirs including these three was 71% of total capacity.

Colorado

Prospects vary widely, streams east of the Continental Divide promising runoff generally in excess of the 1936-45 average, while Rio Grande Basin streams will be in generally low supply (from 65 to 90% of average). Southern Colorado Basin streams will flow substantially below normal but those in the northern part of the basin will exceed the average. Forty-seven reservoirs have filled to 41% of total capacity, as compared with an average April 1 filling of 32%.

Idaho

The snow pack is progressively lighter from north to south, so that runoff substantially in excess of the 10-year average is in prospect for northern streams but some southern areas will have subnormal supplies. Kootenai and Clark Fork will experience heavy runoff, with some likelihood of floods. Mid-Idaho stream discharges will be about normal, with no severe floods in prospect and a water supply generally adequate for irrigation. In extreme southern and western areas the outlook is for irrigation shortages ranging from slight to severe, depending on weather conditions during the planting and growing seasons. Water stored in nine major reservoirs, including Jackson Lake, is 87% of capacity as compared with the 10-year average of 77 per cent.

Montana

Runoff prospects are 15 to 20% better than a year ago, with reservoir storage also higher. Precipitation is above average, recent heavy storms having reversed the previously developing dry trend. Stream flow is about normal for mountain streams, while severe floods have occurred in the eastern part of the state. Soil moisture conditions are good. Seventeen reservoirs west of Continental Divide are 39% full, or slightly better than on April 1, 1946; 23 in Missouri drainage are at 74% of capacity (64% last year), and Fort Peck reservoir is 79% full (68% a year ago).

Nevada

The summer runoff available for irrigation will be short, with the general average ranging from 40 to 50% of the 1936-45 average. Soil moisture and ground water conditions are fair, but the snow-water storage on the mountains is poor. Reservoir storage is very good, and total storage may reach 90 to 95% of reservoir capacity, thus helping to alleviate the shortage of natural stream flow.

New Mexico

Rio Grande drainage promises runoff substantially below the 1936-45 average, only Taos River showing a discharge in excess (125%) of normal. Other forecasts for the basin, in per cent of normal, are: Chama, 65; Embudo, 52. The main river, at Otowi Bridge, 76. Discharge of Pecos River will be less than half (48% of the 10-year average), while that of Canadian River, while better than Pecos, will be only 75% of the average. Four major reservoirs are 33% full, as compared with a normal of 46%.

Oregon

Water supplies in many areas will be about comparable to 1944; 72% of irrigated lands will have good-to-fair supplies; these are served chiefly from reservoirs holding substantial carry-over from 1946. Most lands dependent upon unregulated stream flow will have supplies ranging from fair to deficient. Mountain snow cover is below average on 91% of all measured snow courses, and if precipitation during the runoff season is normal or less, stream flow below normal is certain for all streams except Hood River and Wallowa River. However, watershed soils are wetter than average, thus favoring flow from the deficient snow pack. Crop land soil moisture is generally good, with fallow lands showing better than average. About three-fourths (73%) of the more important reservoirs are half full or better; the general picture as regards storage is slightly better than the 10-year average—73% of total capacity as compared with 70% average.

Utah

Most watersheds will yield satisfactory irrigation supplies. While total runoff, including flood waters, may be lower than normal, stream flow is expected to hold up through the late irrigation season. April-September runoff will range from 70% of the 1936-45 average for Price River (near Heiner) to 132% for Strawberry River (near Duchesne). Storage is at a high point, with the principal reservoirs showing storage totaling 72.4% of capacity. Utah Lake and Bear Lake are at the highest levels in many years. Storage users should, therefore, have adequate water with the possible exception of those on Price River, as the holdover in Scofield reservoir is very low.

Washington

Prospects are for supplies ranging generally from somewhat above to only slightly below normal. Storage generally exceeds the 1936-45 average, five principal reservoirs being 94% full as compared with the 10-year average of 65%. Plenty of water in the main stem of Columbia River appears assured for generation of electric power; high river stages and some flood damage may, in fact, occur.

Wyoming

Prospects as regards both runoff and storage average better than normal. Runoff of five principal streams will be as follows: Shoshone, below reservoir, 133% of the 1936-45 average; Big Horn, at Riverton, 115; Popo Agie, at Riverton, 97; North Platte, at Saratoga, 97; Laramie, at Jelm, 123. Eight principal reservoirs are 45% full, as compared with the 10-year average of 25%.

British Columbia

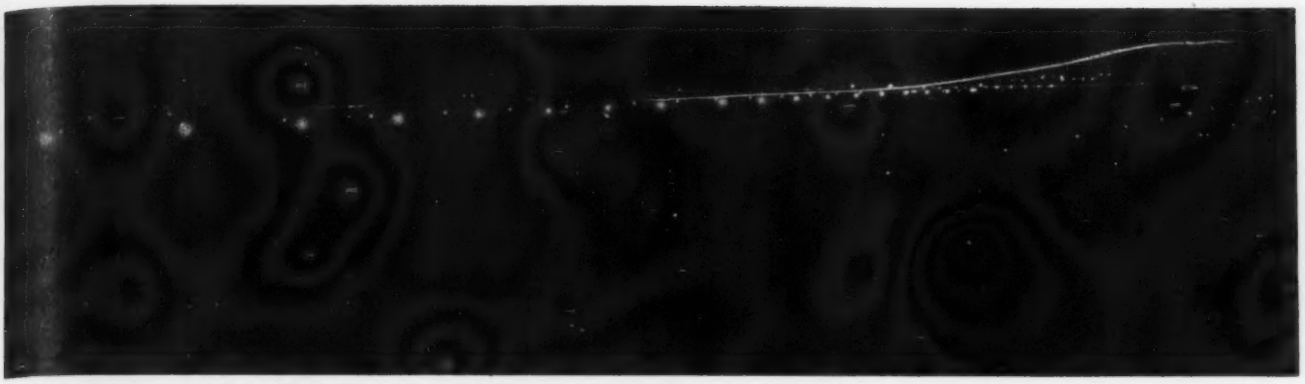
Above-normal runoff is expected for all streams in the Kootenai-Columbia Basin, including Okanagan. North Thompson River at Barriere and Powell River on the coast should also flow above normal. Indications are that an early breakup is ahead, the flow of some streams being above normal. At all snow courses the ground is moist and not frozen beneath the snow cover.

Great Plains States

Storage in one South Dakota reservoir is 78% of capacity, as compared with an average of 44%. Three Nebraska reservoirs are 58% full; average 17%. One Okalohma reservoir is 32% full. Two Texas reservoirs are 79% full; average 80%.

Detailed Forecasts Available

Reports detailing the results upon which the foregoing summaries are based may be obtained by addressing the Division of Irrigation and Water Conservation, Soil Conservation Service, College Hill, Box D, Logan, Utah. Requests should identify the state or drainage basin about which information is desired.



Trace of plane can be seen as the craft lands at Moffett Field, south of San Francisco, guided in by Navy's new high-intensity lighting system

Navy Gets Bright Lights and Safe Landings

High-intensity lighting, augmenting ground-controlled approach (the radar guiding system known as GCA), puts the Navy's Moffett Field, along the southwestern shore of San Francisco Bay, among the world's finest airports, in terms of ability to land planes safely in all kinds of weather.

Although installation of the high-intensity lights at Moffett Field did not get under way until this year, most of the work was completed in six weeks, as against the original estimate of six months. Officers in charge give credit for this speedy job to Charles A. Langlais Co., San Francisco, the electrical contractor.

The installation consists of parallel rows of lights, throwing out parallel horizontal and vertical beams which outline the runway and approach area. Intensity of light can be regulated at the control tower to match atmospheric conditions — either day or night — so that clearly visible but never blinding light can be provided throughout the range of clear to heavy fog.

The basic lighting unit employed is the Bartow fixture, manufactured by Line Material Co. (see illustration). It utilizes a 200-watt incandescent, 6.6-amp. series lamp; an adjustable optical system delivers a vertical beam and two 40,000-candle-power horizontal beams in opposite directions. Color filters are inserted as desired.

Along the runway the lights stand 24 in. above ground on grooved column bases which break easily in case a plane hits one, resulting, as experience has proved, in destruction of the lamp but no damage to the plane. Mounting in the approach area is on poles rising to 55 ft. at the end farthest from the runway, height being governed by neighboring obstacles.

Three circuits carrying about 32 lights each serve the 7,500-ft. runway, and a fourth circuit serves the 2,400-ft. approach.

As a pilot approaches the field he first encounters the red approach lights, indicating the vertical clearance of obstructions and the direction of the runway. Bright green lights mark the edge of pavement, white lights outline the runway proper. Amber lights warn

Two of the Bartow units which outline the Moffett Field runway. Similar units, but mounted on poles, are used for approach

him throughout the last 1,500 ft. of runway. Taxiway lights are blue, semi-flush.

Changes in light intensity — from 1% to 125% of rated capacity—are accomplished by tap changing on auto-transformers, this operation being controlled by fingertip switches in the field control tower.

Power is obtained from the field's 2,300-volt network and fed to four 7½-kw. regulators, each associated with one of the previously mentioned lighting circuits.

Satisfactory results depend greatly on proper beaming of the lights. Experiments to date have led to the use of 2-deg. vertical beams, and 8-deg. horizontal beams.

The two-direction horizontal beams are to accommodate planes landing in either direction, although most landings take place in one direction, over the normal approach, because of prevailing winds.

When used in conjunction with GCA, the lights provide valuable assistance at the point of contact.

Cost of the lights was $52,000, and of equipment and material $23,000, these figures covering 106 lights, 36,000 ft. of cable, constant current regulators and accessory equipment.

Capt. K. B. Bragg represented the Navy Department as officer in charge of construction, and Commander J. S. Marsh was the resident officer in charge. Designing engineers were O. O. Rands of the Twelfth Naval District and P. Victors of the Moffett Field Naval Air Station. Howard Field and J. Van de Veer were in charge for the Langlais Co.

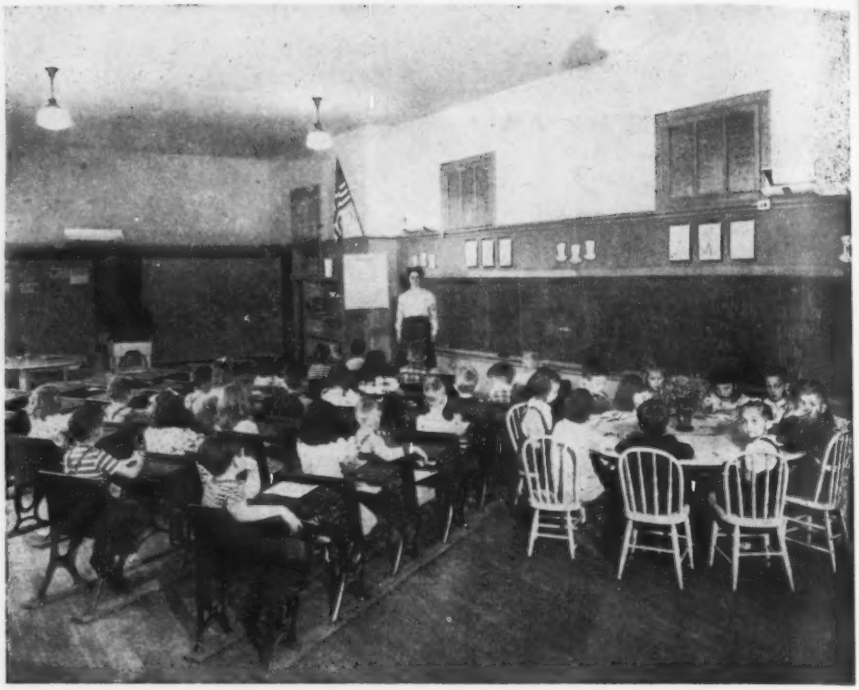
Moffett Field is the only one in the vicinity with high-intensity lighting. Neighboring major airports are frequently plagued with poor visibility so the new system may prove of great value to both civilian and military planes. The Naval Air Station, Seattle, has high-intensity lighting (except the approach); other West Coast installations are in Alaska.

THE WAR ON GERMS

More evidence of what germicidal lamps can do in reducing respiratory diseases among school children comes from John C. Fremont elementary school at Fresno, Calif. Mrs. Helen Wacaser, principal, made the following statement relative to Fremont school's germicidal installation:

"The attendance records of this year show 75% less absence than last year. Most of the absences in an elementary school are caused by respiratory diseases. We are very pleased with the indicated results."

The experience follows installation of 43 Rad-i-Air units, manufactured by the Tru-Air Ultraviolet Products Co., Los Angeles.



Classroom installation of germicidal lamps in the John C. Fremont elementary School of Fresno, Calif. Absenteeism was 75% less in year following installation

One of the classroom installations is illustrated. Units were installed also in the school's cafeteria, lavatories, corridors and administration offices in a project sponsored by the school's parent-teachers association.

One germicidal lamp at one serving center in Blake's Restaurant, Berkeley, Calif., convinced L. W. Blake, owner, that waitresses working near that center caught fewer colds. As a result, he extended protection to entire establsihment—even over garbage cans. Units are G-E, installation by Rochester Electric Co., Berkeley

How About These Underwriters'?

Answers to the most frequent questions as to what the organization is, and what it does—First of two parts

Howard Dodge

How Is Underwriters' Laboratories, Inc. Organized and What Are Its Purposes?

Underwriters' Laboratories, Inc. is a non-profit perpetual trust sponsored by the National Board of Fire Underwriters and is operated for service, not for profit.

The Certificate of Incorporation states: "The corporation shall have no Capital Stock. Its activities for the furtherance of its objects and purposes shall be for service and not for profit. No distribution of any of its property, assets, or income or any portion of them, however, or whatever acquired, shall ever be made to or among any of its members, either by way of dividends, or distribution in liquidation or otherwise, but all of its property shall be considered and deemed to have been and thereby is, dedicated to the accomplishment and furtherance of its objects and purposes. In the event of a dissolution of the corporation, its property and assets shall be transferred in trust for the furtherance of the objects of its incorporation, in such manner and under such conditions and to such persons, firms, associations or corporations as its membership, by majority designation, may appoint."

The nature of the business or the objects or purposes to be transacted, promoted or carried on, also quoted from the Certification of Incorporation: "By scientific investigation, study, experiments and tests to determine the relation of various materials, devices, constructions, and methods to life, fire and casualty hazards, and to determine, define and publish Standards, classifications and specifications for materials, devices, constructions and methods affecting such hazards, and other information tending to reduce and prevent loss of life and property from fire, crime and casualty.

"To contract with manufacturers and others for the examination, classification, testing, and inspection of buildings, materials, devices and methods with reference to the life, fire and casualty hazard appurtenant thereto or the use thereof; and to report and circulate the results of such examination, test, inspection and classification to insurance organizations and other interested parties, and to the public by the publication of lists and descriptions of such examined, tested or inspected materials, devices, and products by provision for the attachment of certificates or labels thereto or in such other manner as from time to time may be deemed advisable."

Also: "To finance, subsidize and endow scientific research and investigation looking to the discovery, invention, and perfection of materials, devices, and methods of use or construction intended to protect life and property from fire, crime and casualty; and to publish and circulate the results of its investigation and research, or the investigation and research of other scientific organization affecting such hazards."

Its services to manufacturers represent only the independent judgment of Underwriters' Laboratories, Inc. given with due consideration to the necessary limitation of their practical operation, and in accordance with the objects and purposes as mentioned. Underwriters' Laboratories, Inc. neither assumes nor accepts responsibility for the effect of these services, reports, listings, requirements and labeling, on relations between manufacturers or others, or on the sale of products.

What Is the Difference Between Reexamination Service and Label Service?

The promulgation of listing is contingent upon the establishment of one type of inspection service. This inspection service is intended to supplement and check the manufacturers own regular inspections to insure compliance of the factory output with the requirements established for the product. Selection of the form of inspection service for a particular product rests with the Laboratories.

The label service consists of inspections of the listed product at the factories by inspectors of Underwriters' Laboratories, Inc., and the manifesting of goods found to conform to the Laboratories' requirements by labels (which may be in any form or material adapted to the product and its use), whereby they may be identified at all times. All such labels include the words "Underwriters' Laboratories, Inc., Inspected." The label constitutes a report by Underwriters' Laboratories, Inc., that the device (or material) to which it is attached has been produced under the Factory Inspection Service of the Laboratories, and that it complies with the requirements of the Laboratories' Standards for such devices. Various subscribers to the Label Service have arranged to combine the manifest bearing the words "Underwriters' Laboratories, Inc. Inspected" with their own nameplates. In all such cases such combination labels are furnished by the Laboratories, and the methods of delivery and supervision are the same as with the standard form of labels.

The reexamination service of Underwriters' Laboratories, Inc. includes the examination and test, one or more

A Note on the Author and the Origin of the Questions

Because Underwriters' Laboratories are accepted as the makers of standards by which the electrical industry measures safety from fire and personal injury hazard, reference is made to it in many codes, ordinances and state laws. As unsafe appliance control ordinances are passed the Laboratories are looked upon by the industry as the impartial judge of safe equipment. It is only natural that many questions arise as to how it functions and what it is, how it labels or lists approved materials and devices, or how the user is to determine whether a device is listed.

These questions come to the Laboratories staff every day. Howard Dodge, electrical engineer in charge of the San Francisco branch laboratory, noted the most frequently asked questions. At a recent meeting of the Northern California Chapter, International Assn. of Electrical Inspectors, Dodge enumerated the questions—and gave the answers. Because they are the questions any inspector, contractor, wireman, electrical manufacturer or anyone else in the industry might also ask, his answers are given here.

times yearly, of the samples of the listed devices and materials obtained in the open market or from the factory of the manufacturer. If, in the examination and test of listed products, features are found which are not in compliance with the Laboratories' requirements, such features are to be corrected by the manufacturer in subsequent production, or listing may be discontinued.

Products listed under the reexamination service are identifiable by manufacturer's trade-mark, symbols, tradenames, and catalog designations which are given in the List of Inspected Electrical Equipment. Symbols called "Reexamination Service Markers" to appear on nameplates or on tags or containers under specified conditions are employed in some cases to supplement the required means of identification. It is to be noted that such markers do not necessarily appear on all devices which are listed under reexamination service—in other words, the use of the marker is optional with the manufacturer. The use of the "Reexamination Service Markers" and/or any of these specified markings for reexamined products is the manufacturer's assertion that they are listed.

The appearance of a manufacturer's name in the List of Inspected Electrical Equipment does not mean that all his products of the listed classification comply with the Laboratories' requirements. Only those devices and materials which actually carry the special designation or marking shown in the List are covered by reexamination service.

Does Underwriters' Laboratories Have Anything to Do With the Adoption or Enforcement of Local Ordinances?

Although many calls are received regarding local ordinances such questions are always referred to the local authorities having jurisdiction. Underwriters' Laboratories, Inc. has nothing to do with the adoption or enforcement of local ordinances.

Is It Necessary to Read the Underwriters' Label Attached to a Device?

The importance of reading the label cannot be over-emphasized because it may not cover what is assumed at first glance. This may be best illustrated by several examples. (1) The label attached to an ordinary surface, wall or pendant mounted fixture merely reads "Electric Fixture" while the label attached to a unit intended for recessed or semi-recessed installation bears a "Recessed Electric Fixture" label. Obviously, a fixture bearing an ordinary "Electric Fixture" label is not suitable for recessed installation. (2) Several labeled individaul panelboards installed in a deadfront switchboard do not constitute a labeled deadfront switchboard. The label on each panelboard covers the panelboard itself while a label attached to a section of a deadfront switchboard covers all of the equipment in that particular section. (3) A label reading "Cutout Box" would cover only the metal box and would not include electrical equipment such as fuse blocks or switches installed in the box.

While these illustrations serve to emphasize the need for reading the label, the importance of following this procedure may be further illustrated by that one alert municipal inspector found several years ago. While making a routine check of several new electric sign installations he had an occasion to examine a sign installed several stories above the street. In looking for the label through a pair of field glasses he was surprised to note that nothing but a plain piece of ordinary brass, the same size as a real label, had been used! This incident should emphasize the importance of reading the labels.

(Concluding Questions Next Month)

Samples of the Cartoon Wiring Promotion Deal

Two of the 26 cartoons which make up the advertising program originally designed for Nebraska Power Co. Following that utility's success with the campaign, it has been offered to any company for local use, at urging of National Adequate Wiring Bureau. Allen & Reynolds advertising, Omaha, sells the 26 cartoon mats for $91, with reprint permission

"HERMAN! YOU LET AGATHA PLUG IN HER HAIR DRYER FOR A FEW MINUTES!"
Don't overload your wiring system. When you build or modernize provide ADEQUATE WIRING.
© NEBRASKA POWER CO.

"WHICH DO YOU WANT FIRST, DEAR--TOAST, COFFEE, OR YOUR PANTS PRESSED?"
Don't overload your wiring system. When you build or modernize provide ADEQUATE WIRING.
© NEBRASKA POWER CO.

rdinary
ot suit-
2) Sev-
ards in-
oard do
adfront
panel-
itself
tion of
all of
ar sec-
Cutout
tal box
equip-
witches

rve to
the la-
g this
strated
pector
mak-
l new
ad an
stalled
et. In
a pair
ed to
ece of
a real
cident
ce of

Ade-
naha,
ssion

1950-1960

USA

e Twentieth Century Fund, a privately-endowed
search foundation, has just completed a monu-
ental 875-page work called "America's Needs and
sources." In it is presented a detailed preview of
at economic life in the U. S. A. during the 1950-60
cade will be like if we succeed in maintaining high-
el employment. From the findings of the Twentieth
ntury Fund survey, the McGraw-Hill Department
Economics has prepared this synopsis, which high-
hts points of interest to readers of this magazine.

1940
1950
MORE PEOPLE WORKING . . .
EACH PRODUCING MORE . . .
CAN TURN OUT ENOUGH GOODS AND SERVICES . . .
FOR CONSUMERS, CAPITAL INVESTMENT AND GOVERNMENT
WITH THE RESOURCES AVAILABLE . . .
TO MEET ALMOST ALL OUR NEEDS
NEEDS
PRODUCTION

POPULATION

A nation's wealth depends more than anything else on the size and vigor of its population. Much of the increase in U. S. production during the past hundred years is a result of a rapid growth in population. This growth supplied manpower for farms and factories and provided an expanding market for consumer goods and services.

MORE PEOPLE WORKING . . .

Growth was the outstanding fact about population before 1930. The birth rate was almost double the death rate and there was a heavy flow of immigrants. Between 1900 and 1930, the population increase averaged 15 million each decade. Immigration contributed a third of the increase.

But this trend was checked by the depression 30's which stemmed the flood of immigrants and cut the birth rate by forcing postponement of many marriages. As a result, fewer than 9 million persons were added to the population between 1930 and 1940. This was an important factor in prolonging the depression because it slowed the growth of consumer markets.

WARTIME MARRIAGE BOOM

War and postwar conditions have brought a boom in marriages. They have exceeded normal by more than 1,500,000 since 1940. There will be more newly-married couples in 1950 than ever before and the birth rate may be roughly 10% higher than in the early 1930's. So the 20th Century Fund looks for an increase of 12 million in total population between 1940 and 1950 and a further increase of 10 million in the 1950's.

This will mean a faster-growing market for homes, autos, food, clothing, and other consumer items than we had in the 1930's. It will mean crowded schools and more people seeking jobs.

There are four major population trends which will affect markets in the 1950's:

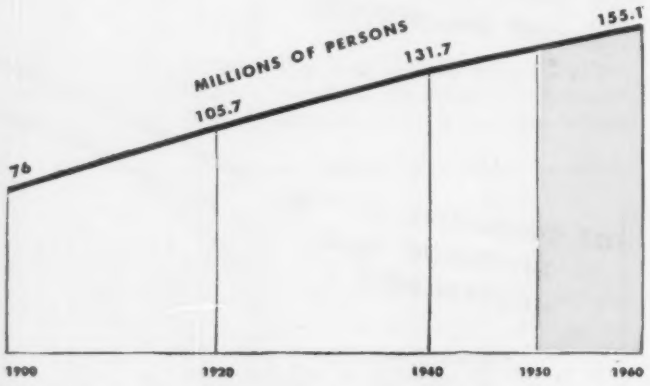
1. The number of families will continue to increase more rapidly than the number of people as families grow smaller. This is significant because the market for housing, appliances, and many other things depends more on the number of families than on the number of people.

2. Our population will be getting older. But it will not be getting less productive because the proportion of the population between the ages of 20 and 60 will be higher than in past decades. Still, the most striking increase will take place in the number of people over 60—from 14 million in 1940 to more than 20 million in 1960. This will bring greater demand for medical services and social security. An important cause of this trend is our success in controlling communicable disease. The following table shows how the death rate from selected causes has changed since 1900.

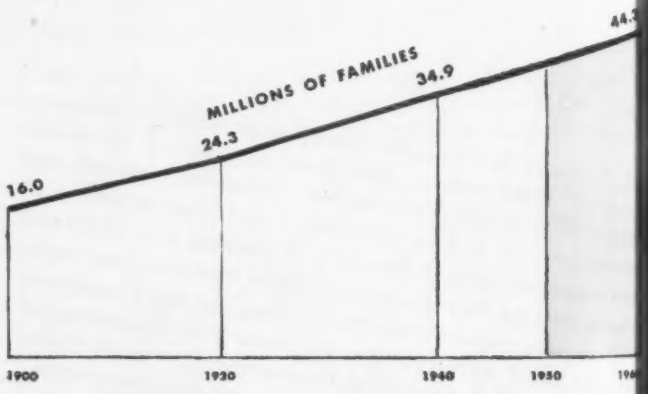
Death Rate Per 100,000 Persons

	1942	*1900*
Diseases of heart	295	137
Cancer and other malignant tumors	122	64
Influenza	56	202
Tuberculosis	43	194
Diarrhea and enteritis	9	143
Whooping cough	2	12
Diphtheria	1	40
Measles	1	13
Typhoid and paratyphoid fever	0.5	31
Scarlet fever	0.3	10
Other	505.2	873
	1035.0	1719

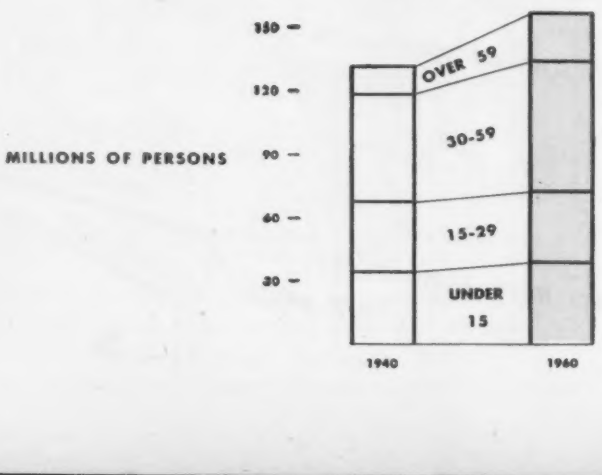
TWICE AS MANY PEOPLE



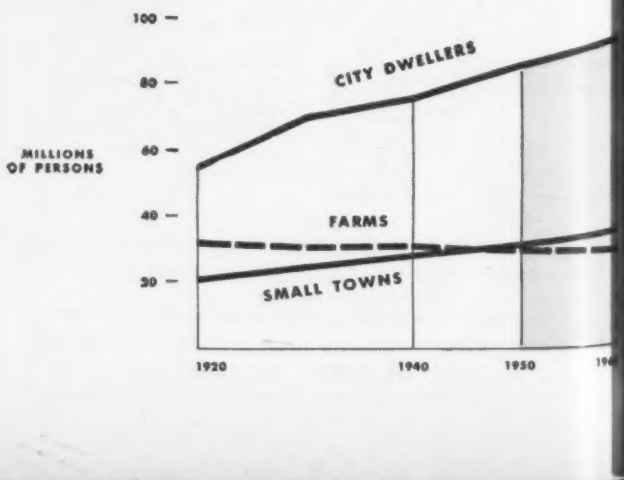
BUT THREE TIMES AS MANY FAMILIES



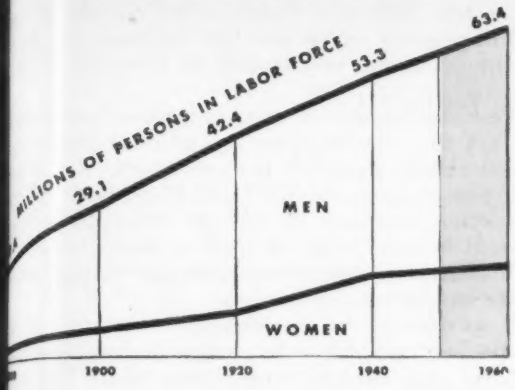
MORE OLDER PEOPLE



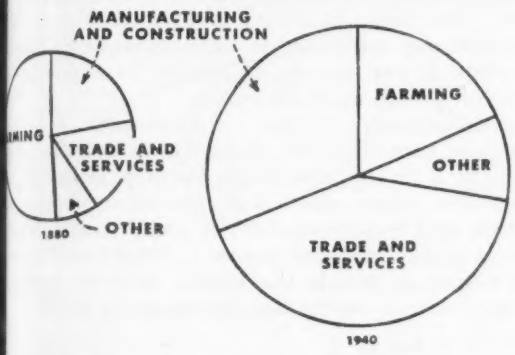
MORE CITY DWELLERS



MORE AND MORE WOMEN ARE SEEKING JOBS

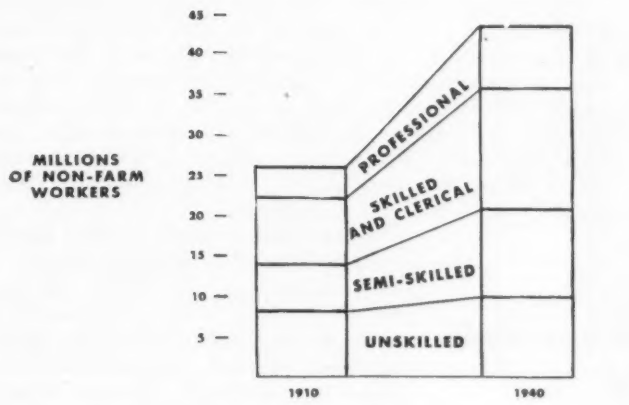


FARMING IS GIVING WAY TO OTHER OCCUPATIONS



ANATOMY OF THE LABOR FORCE

THE LABOR FORCE IS GROWING MORE SKILLED



3. The population will continue to become more urbanized. Small and medium-sized cities will grow faster than the largest cities. The general westward migration which was accelerated by the war will continue.

4. Our people will keep on getting more homogeneous. There has been almost no immigration since 1929, so the number of immigrants who have been in the country for less than 20 years will make up less than one percent of the population in 1950 as against 9% in 1930.

An even more important factor in making the population all of a kind has been the growth of universal education. The proportion of children 14-17 years old attending high school doubled between 1920 and 1936. The rise of the radio, movies, and national magazines has also levelled us out. These developments not only raise the general educational level of the nation but also tend to standardize the public's tastes and attitudes.

LABOR FORCE

The volume of goods and services produced by 145 million persons in 1950 and 155 million in 1960 will depend on what share of the population is in the labor market and the amount of work those employed actually do. The proportion of the population in the labor force has shown little change in the past few decades. So the 20th Century Fund assumes that the relationship between labor force and population will be about the same in 1950 and 1960 as it was just before the war. On this basis 60 million people will be in the labor market in 1950 and 63.4 million ten years later.

As you can see from the charts, however, there will be several important changes in the composition of the labor force. More women will be working. In 1870 only one out of every eight worked. By 1940 the proportion had grown to one out of four, and evidently will go on rising.

However, the increase in the number of women working will just about be offset by earlier retirements and longer schooling. This explains why there is little change in the ratio of labor force to population.

UNEMPLOYMENT

The effectiveness of the labor force depends not only on its size but on how fully it is employed. We have never had full employment in the sense that everyone able and willing to work had a job at the same time. Even in good years unemployment has seldom averaged less than 5% of the working force because workers are always moving from job to job. And in 1932, nearly one-fourth of all workers were unable to find jobs.

For this reason, the 20th Century Fund assumes that, even with good business in the 1950s, unemployment will average 5% of the labor force. This works out to 3 million unemployed in 1950.

In addition, the Fund expects the long down-trend in average weekly hours to continue. A century ago, workers put in a 12 hour day for 6 days a week. By 1940 the average work-week had declined to 44 hours in non-agricultural jobs and 52 hours in agriculture. If this trend continues, the average in non-farm jobs will be down to 38 hours a week in 1960, and farmers will work 48 hours.

Adding all this up, and allowing for vacations, absenteeism, and sickness, the 20th Century Fund estimates that the U. S. will put in 121 billion man-hours of work in 1950 and 118 billion in 1960. This compares with 105 billion in 1940 and with 154 billion at the peak of the war effort. The quantity of goods and services that can be turned out with this amount of labor effort will depend on average output per man-hour, or productivity.

PRODUCTIVITY

The key to our future economic welfare is productivity. It is the five-fold increase in output per man-hour that has made it possible for us to work shorter hours and still enjoy a rising standard of living. This increase in productivity has been accomplished not by working harder but by constantly inventing better machinery to supplement human energy with mechanical power.

Of course, in any specific factory at any given time, productivity depends largely on the willingness and ability of labor and management. But over the years, the actual effort of the individual worker becomes much less important than the effort of the machine. The most energetic and skilled blacksmith of a century ago could not remotely approach the productivity of today's semi-skilled worker operating automatic power-driven equipment.

EACH PRODUCING MORE . . .

In 1860, the average worker turned out 33¢ (in 1944 dollars) worth of goods in an hour. By 1940, this had grown to $1.22. This sensational increase in productivity was due to the increased use of power-driven machines. In 1860, the average worker had the help of only half a horsepower of animal or mineral energy. In 1940, he had the use of 2.7 horsepower. To put it another way, if there had been no increase in the use of mechanical power since 1850, it would have taken 290 million workers to turn out the amount of goods and services actually produced at the peak of the war effort by only 63 million workers.

DO MACHINES KILL JOBS

Past history also shows that we need not fear the long run effects of the introduction of labor-saving machines. On the contrary, the only way we can improve the material welfare of everyone is to continue and even step up the rate at which we save labor by using machines.

Some people, it is true, are thrown out of work and a few of them may not be able to find other jobs easily. But mechanization more than compensates for "technological unemployment" by making it possible to produce more and better things for everyone—things that themselves create jobs. Development of the railroads and the automobile, for example, put a lot of canal boat and livery stable operators out of business. But it cut the cost of transportation and created many times more jobs than it eliminated.

The 20th Century Fund also points out that the most important reason that the technological revolution developed luxuriantly in the U. S. between 1850 and 1940 was that competitive enterprise provided a generally favorable climate. It is true that natural resources were plentiful and that the population was growing rapidly both in numbers and in skill. But what we had to a unique degree here was an atmosphere which favored risk-taking, fostered the vast capital investment necessary to harness and apply mechanical energy, and provided the incentives necessary to put capital and inventiveness to work.

No other economy has equalled ours in the ability to produce more and more with continually diminishing human effort. The test it now faces is whether it can eliminate the ups and downs in production and employment that have gone along with it. But an abundance of evidence indicates that we ran into trouble after 1929 not because we developed too many labor-saving machines but because we didn't adjust our economic mechanism to keep the process going.

The key importance of mechanization is indicated by the fact that the increase in national production since 1860 closely parallels the increase in use of mechanical power. Between 1860 and 1940, both volume of production and use of energy multiplied about 11 times. It is clear that, in order to keep our standard of living rising, we must continue to apply more and more power to production.

Chief advantage of mechanical energy is, of course, its low cost. Electric energy is now delivered for as little as a cent a horsepower, while the same amount of human energy costs $10.

And there are other important advantages. Mechanical energy can be delivered in greater concentration than any other form. It is also more convenient, compact, mobile, and controllable. Consolidated Edison in New York delivers enough electricity in a day to do the work of 3 million draft horses.

These advantages are now so universally accepted that it's hard to realize how recently we left the horse and buggy era. At the turn of the century, animals and men provided more than half the energy used in production and transportation. It wasn't until World War I that trucks replaced horses in local hauling and tractors began to invade the farms. Here is how the use of mechanical energy has grown since 1850:

	Total Energy Output (Billions of Horsepower-Hours)	Percent Supplied by:		
		Mechanical Energy	Humans	Animals
1850	17.6	6	15	79
1860	25.2	7	14	79
1870	27.8	12	15	73
1880	39.9	17	14	69
1890	61.1	28	12	60
1900	82.9	38	10	52
1910	131.4	57	8	35
1920	197.4	73	6	21
1930	238.3	84	5	11
1940	289.4	90	4	6
1950	410.4	94	3	3
1960	489.8	96	2	2

PRODUCTIVITY IN THE FUTURE

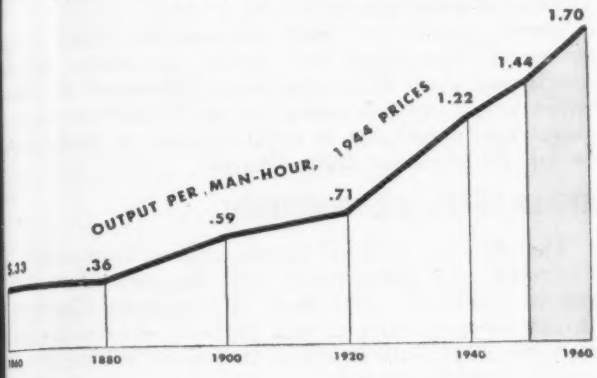
Any attempt to predict future developments in productivity is complicated by the fact that the changes do not occur at an even rate. Between 1850 and 1940 the average increase in output per man-hour was 18% per decade. But the changes varied all the way from 3% between 1870 and 1880 to 42% for the decade ending in 1940. There is, therefore, no simple way to extend past trends to obtain a foolproof figure for productivity at a future date.

For purposes of this study, however, the 20th Century Fund assumes that the average rate of increase since 1850 may be projected to estimate output per man-hour in 1950 and 1960. Thus, output per man-hour works out to $1.44 in 1950 and $1.70 in 1960 against $1.22 in 1940 (all in 1944 dollars).

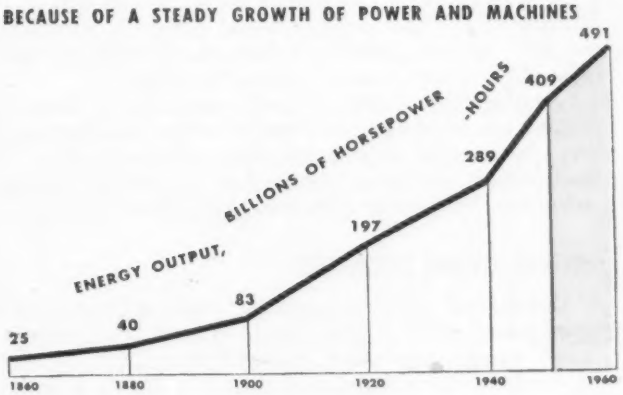
As the Fund points out, this is a critical assumption, and it is further complicated by the fact that there is a wider possibility of error in this estimate than in most of the others in the study. If, for example, it is assumed that productivity will increase at the pace set from 1920 to 1940 which averaged 36% per decade, then 1960 production would be about double the 1940 level instead of only 157% of it, as the 20th Century Fund estimates.

A CENTURY OF ECONOMIC PROGRESS 1860 – 1960

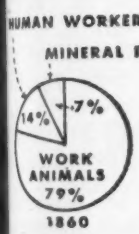
OUTPUT PER MAN-HOUR SHOULD BE 5 TIMES AS GREAT

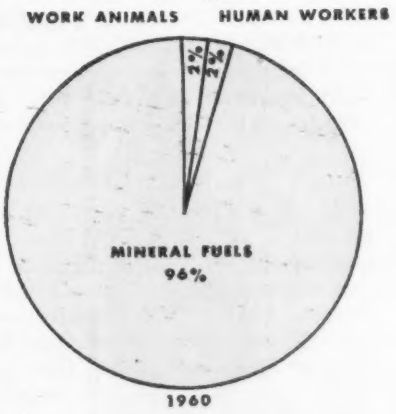


BECAUSE OF A STEADY GROWTH OF POWER AND MACHINES

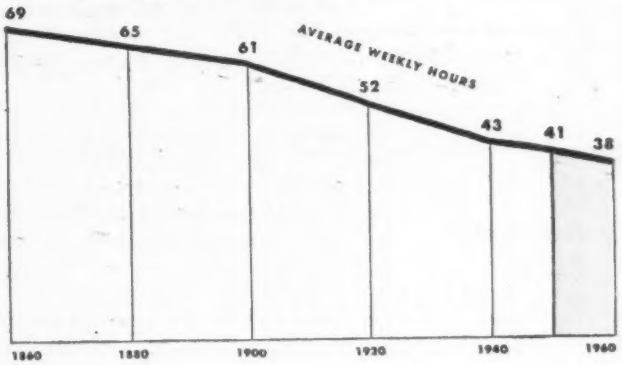


SO WITH LESS EFFORT

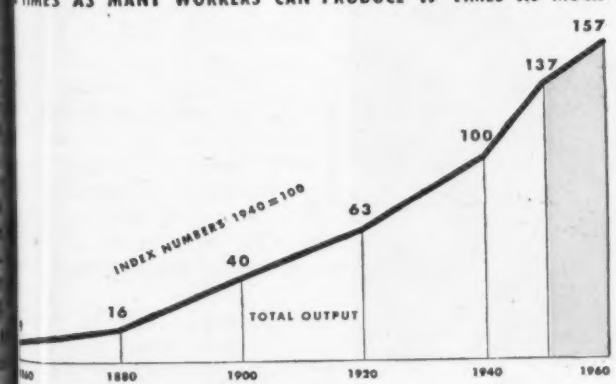




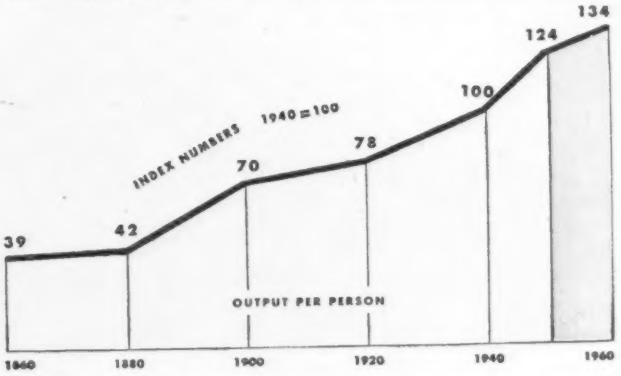
AND A SHORTER WORK WEEK



5 TIMES AS MANY WORKERS CAN PRODUCE 17 TIMES AS MUCH



AND PROVIDE 3½ TIMES AS MUCH OUTPUT FOR EACH PERSON



TOTAL NATIONAL OUTPUT

The potential volume of goods and services in 1950 and 1960 can be determined by simple arithmetic, using the assumptions outlined on the preceding pages. Of an estimated population of 145 million in 1950, about 60 million persons will be in the labor market and 57 million of them will have jobs if we succeed in keeping business activity at a high level.

This many people would work 121 billion man-hours. With output per man-hour estimated at $1.44 (in 1944 dollars) the total value of goods and services produced, or the gross national product, would come to $177 billion. Similar calculations yield a gross national product of $202 billion for 1960.

As the 20th Century Fund emphasizes, these estimates are neither a forecast of actual production nor an appraisal of maximum potential production. They are merely an attempt to show in dollars and cents what can be achieved with high-level employment.

HIGHER LIVING STANDARDS

Compared with any prewar year, a gross national product of $177 billion in 1950 and $202 billion in 1960 would represent a handsome gain. It would make possible a substantial rise in living standards. In 1950 we would produce a fifth more than in 1941.

CAN TURN OUT ENOUGH GOODS AND SERVICES . . .

However, the volume of goods and services turned out in 1950 would be only slightly higher than present production. This is because the number of persons at work today is 2 million above the estimated normal for 1950, and average weekly hours are higher than they will be then. Almost a million and a half of the emergency workers drawn into the labor force during the war are still at work and unemployment is lower than the figure assumed for 1950.

The estimates of 1950 and 1960 gross national product, as well as the figures for past years used in the chart, are expressed in 1944 prices. This is not a prediction that the price level will settle down to the 1944 level which would involve a drop of 18% in the cost of living and 26% in wholesale prices. It is merely a device to eliminate price fluctuations so that the figures will show only the actual changes in the physical volume of production.

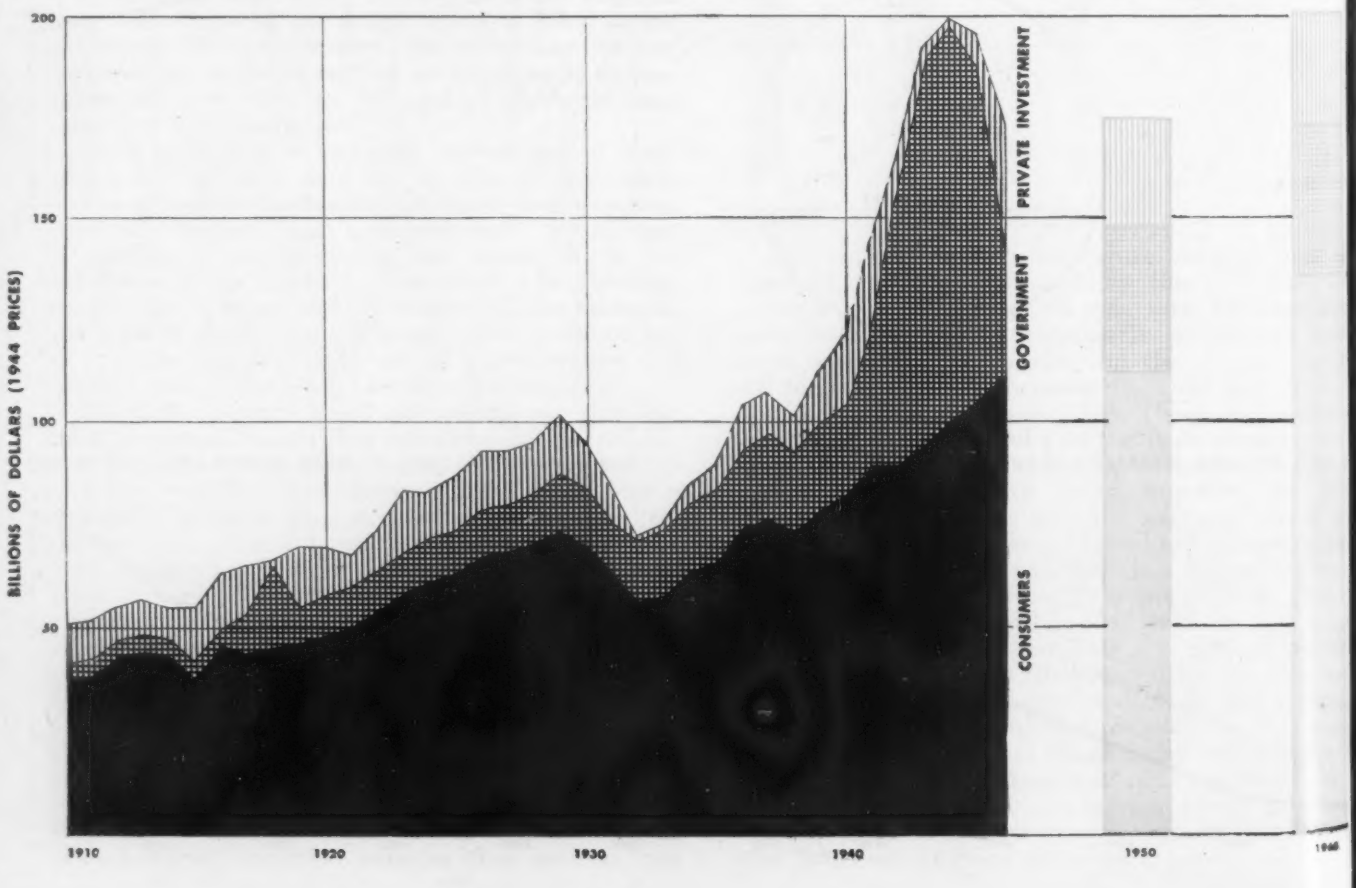
Gross national product measures the total market value of everything the nation produces. All the goods and services produced are absorbed in one of three ways: by consumer expenditures; by expenditures for investment in capital goods or inventories; or by government expenditures.

HIGHER TAXES, LESS INVESTMENT

The division of total output among consumers, investment, and government will be somewhat different in 1950 and 1960 than in the past. About two-thirds of total output will go into consumer goods and services. This is about the same as the proportion in prewar years.

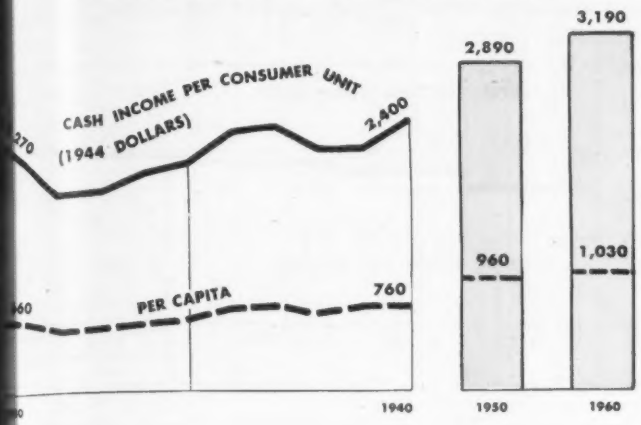
Government's share will continue to grow, however. It rose from 11% of total output in 1929 to 17% in 1940. At the peak of the war effort, half of all production went to Uncle Sam. Government expenditures have dropped to less than half the war peak and they will continue to decline slowly. But government's share will still run to around 20% in the 1950's. On the other hand, the ratio of investment to total output shows a slight long term decline.

HOW TOTAL OUTPUT IS DISTRIBUTED

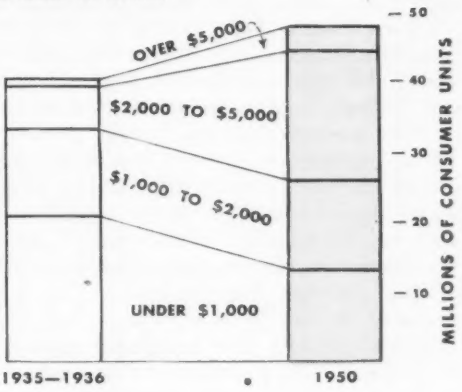


MORE CONSUMER PURCHASING POWER

CONSUMERS WILL BE ABLE TO BUY 50% MORE THAN IN 1930'S



EVERY OTHER FAMILY... INSTEAD OF EVERY SIXTH FAMILY... WILL HAVE $2,000 OR MORE TO SPEND.



CONSUMER INCOME

U. S. business can look forward to a 1950 consumer market twice as large as in the worst year of the depression, half again as large as in 1929, and one-fifth larger than in 1941. That is the major conclusion of the 20th Century Fund's analysis of consumer purchasing power. Here are the steps by which it arrives at that conclusion:

1. With gross national product at $177 billion in 1950, past experience indicates that income payments to individuals would run to $138 billion.

2. Income tax rates are assumed to equal the 1942 schedules, so individuals would pay $11 billion in taxes (as against $19 billion in 1946).

3. Savings are estimated at $12 billion, or about 9% of income after taxes.

4. Subtracting taxes and savings, consumer purchases of goods and services would total $116 billion.

LOWER SAVINGS

Many experts would criticize the assumption that savings will amount to only 9% of income. Some of them look for a ratio as high as 20% in prosperous postwar years. The 20th Century Fund justifies the use of a low figure on three grounds: (1) people built up reserve of savings during the war; (2) expanding social security will reduce the need to save for old age; and (3) taxes will cut into savings. The Fund's estimate of savings plus taxes in 1950 adds up to a higher percentage of income than in prosperous prewar years.

The standard of living won't rise as rapidly as the total income going to consumers, because the increased income will be split up among more family units. But the average consumer unit (a family or a single person living alone) will be a third better off in 1960 than in the 1930's.

Shifts in the distribution of income will be even more important, from a marketing standpoint, than the general increase in over-all consumer income. More consumer units will be in the over-$2000 brackets than ever before and this group will be receiving a much larger share of total consumer income.

Part of the apparent increase in income is cancelled out by higher prices. To show the actual increase in purchasing power, the figures should be adjusted for an estimated one-third increase in the 1950 price level over that of the mid-1930's. This would mean that a $2,650 income in 1950 would buy no more than a $2,000 income in 1935-36. Even if this adjustment is made, the resulting figures still show a striking upward shift.

Income Class	Consumer Units in Millions		Cash Income in Billions	
	1935-56	1950	1935-36	1950
Total	39.2	47.9	$85.0	$135.0
Under $1000	20.8	13.0	17.0	7.7
$1000-2000	12.2	12.9	28.1	21.5
$2000-5000	5.5	18.2	23.8	62.1
Over $5000	0.7	3.8	16.1	43.7

FOR CONSUMERS..

In addition to dollar income, shown in the above table, consumers also receive "income in kind"—food and fuel produced by farmers for their own use, board and lodging received by domestic servants. Such income will have a value estimated at $3.3 billion in 1950, most of which will supplement the $7.7 billion received by those in the "under $1000" bracket.

The urban market will continue to be far more important than the rural market. Consumer units in cities will receive cash incomes of $3,445 on the average in 1950, more than twice the farm average of $1,635 and almost twice the small town average of $1,880.

THE FARM MARKET

These figures don't provide an accurate measure of the relative importance of the rural and urban markets because rural consumers pay a lot less for food, fuel, shelter and so have more to spend for other things. If there were any way to adjust for these things, the figures would show a smaller spread between the two markets, but the urban market will still be dominant.

All these figures underline a general upgrading in consumer demands which would accompany high-level production and employment. It will have a profound effect on marketing practices. The average person will eat better, dress better, and live in a better house with better equipment. And he will have more money to spend for travel, recreation, and luxuries.

CONSUMER MARKETS

The improvement in living standards during the 1950 decade will lead to important changes in the way consumers spend their dollars. Even though they will eat better, dress better, and live in better houses, a smaller share of the consumer dollar will be spent on food, clothing and shelter. A growing share will go for appliances, furniture, travel, and recreation.

This means that the fastest growing markets will be those providing what might be called "optional" goods and services — things which add to comfort and enjoyment but which are not strictly necessary. Markets for necessities, on the other hand, will expand at a slower rate than total consumer expenditures.

The growing importance of "optional" goods and services is one of the reasons why it's increasingly difficult to keep our economic machine going on an even keel. The purchase of "optional" goods can be postponed with little hardship. So anything that causes people to put off buying a new car, a new house, or a new radio has a far greater effect on production and employment now than it did when the major share of the consumer dollar went for necessities.

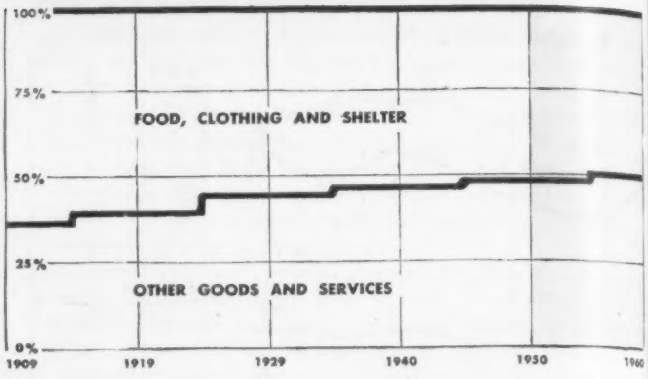
Some of the trends in major markets are summarized in the following sections.

FOOD

Although food is by far the largest item in the consumer budget, its relative importance is declining slowly as living standards rise. People eat the same number of pounds of food they ate in 1909 but the food is better from a nutritional standpoint and easier to prepare. Thus, the trend favors fruits, vegetables, and dairy products as against meat, potatoes, and bread.

More and more food is being processed in factories rather than in consumer kitchens. Improved methods of manufacture and distribution have transformed the luxury foods of yesterday into the standard foods of today. New kinds of processed foods — canned, frozen, and dehydrated — are appearing constantly.

STANDARD OF LIVING YARDSTICK: MORE OF THE CONSUMER DOLLAR GOES FOR THE COMFORTS OF MODERN LIFE



CLOTHING

Three long term trends will shape the clothing market in the future: (1) the shift from home and custom to factory fabrication is almost complete;

WHERE CONSUMER DOLLARS GO

(Figures in Billions of Dollars)

	1909	1919	1929	1940	1941	(1944 Prices) 1950	1960
Total Consumer Expenditures	28.8	60.8	80.3	70.6	80.4	116.2	134.2
Food, Liquor, and Tobacco	9.9	22.3	23.7	21.9	25.3	36.2	41.1
Food	7.4	18.8	19.9	16.4	19.0	27.2	30.8
Liquor and Tobacco	2.5	3.5	3.7	5.5	6.3	9.0	10.3
Clothing and Personal Care	4.4	9.8	12.1	9.8	11.5	16.2	18.7
Housing	6.8	10.1	14.4	12.6	13.3	19.3	21.4
Rent a.	5.5	7.9	11.3	9.1	9.7	14.0	15.4
Fuel	1.0	1.5	1.7	1.7	1.8	2.5	2.8
Electricity	0.1	0.3	0.6	0.9	1.0	1.6	1.8
Household Equipment and Operation	2.8	6.2	10.6	8.7	10.3	15.0	17.4
Appliances	0.2	0.4	0.8	1.0	1.3	1.8	2.4
Consumer Transportation	1.6	5.2	8.6	7.3	8.6	12.7	16.4
Autos and Private Planes b.	0.6	3.5	6.0	5.7	6.8	9.6	12.7
Local Bus and Street Car	—	—	0.8	0.7	0.8	1.5	1.5
Intercity Bus	—	—	0.1	0.1	0.2	0.2	0.2
Airlines	—	—	c.	c.	c.	0.1	0.5
Railroads	0.4	0.8	0.6	0.3	0.3	0.4	0.3
Medical Care, Insurance, and Death Expenses	1.1	2.8	4.5	4.7	5.2	7.7	8.7
Recreation	0.9	2.1	3.8	3.3	3.7	5.7	6.9
Radio and Television Sets	0.2	0.7	1.0	0.6	0.8	1.1	1.3
Private Education, Religion, and Welfare	1.2	2.2	2.7	2.3	2.4	3.4	3.7

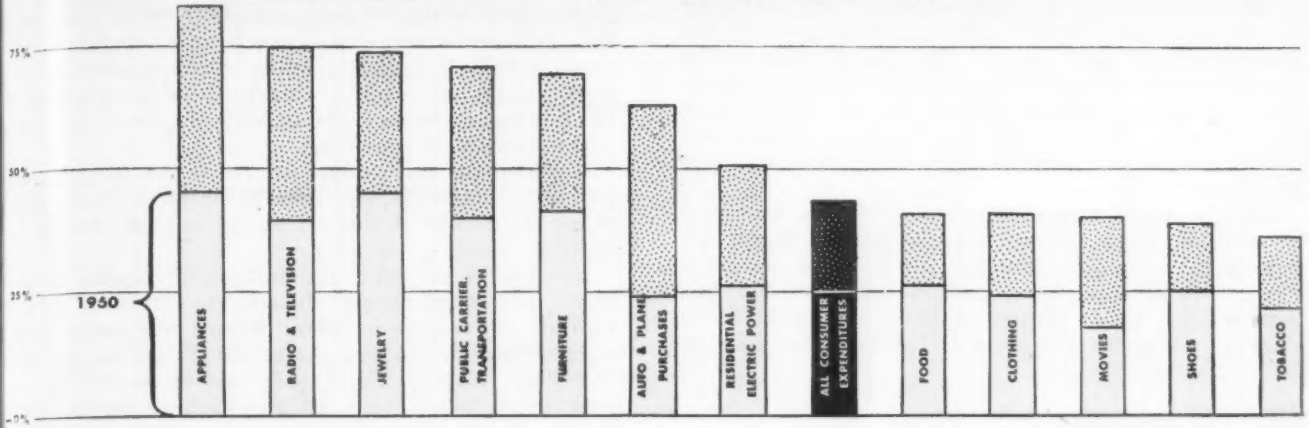
a. Includes Estimated Rent for Owner-Occupied Homes.

b. Includes Original Cost and Operating Expenses.

c. Less than $50 Million.

CONSUMER MARKETS IN 1950 AND 1960: Percent Increase in Sales Over 1940

Bottom Segment Equals Percent Increase 1940-1950; Total Height Equals Percent Increase 1940-1960.



(2) synthetics, chiefly rayon and nylon so far, are replacing cotton, wool, and silk at an accelerating pace; (3) there's greater standardization of styles and a trend to lighter and simpler clothing.

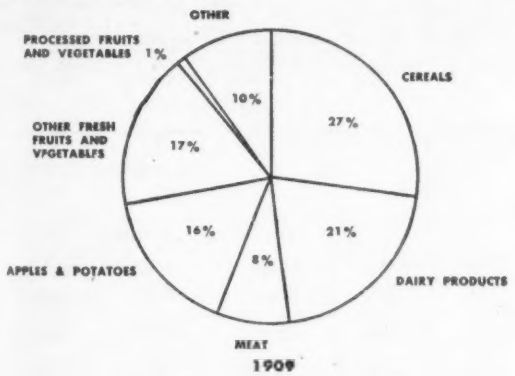
In 1909 consumers spent 14% of their income for clothing but by 1940 the ratio had reclined to 12%. However, this long run decline may be halted or reversed. The migration from farms to cities, the upgrading of incomes, and the growing demand for sports clothing will increase clothing expenditures.

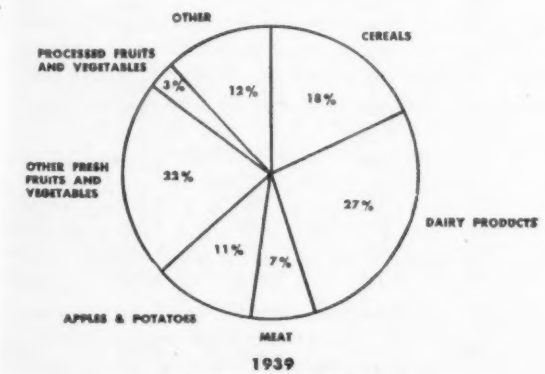
HOUSING

The decline in the relative importance of housing expenditures — from 24% of consumer dollars in 1909 to less than 18% in 1940 — is expected to continue. The reason is that people feel they get more value for their dollars in other things than housing. Nevertheless, the housing market should be much larger in the 1950's than in the 1930's because much of our housing needs to be repaired or replaced.

A Census survey in 1940 showed that 16 million of the nation's 37 million dwelling units needed to be replaced or needed major repairs. The 20th Century Fund estimates that the provision of adequate housing for everyone by 1960 would involve building 20 million new units and rehabilitating 5.4 million at a total cost of $115 billion (1944 prices). The Fund also estimates that we will fall 15% short of this goal even with continued high-level employment.

OUR CHANGING DIET: MORE MILK, FRUITS AND VEGETABLES LESS MEAT, POTATOES AND BREAD





HOUSEHOLD EQUIPMENT

More and more of the consumer dollar has gone for household equipment in the past four decades, largely because of the development of labor-saving appliances. The outlook is for a continuation of this trend. New appliances are being developed; and the large number of new houses slated to be built in the next few years, the wartime and postwar boom in the number of families, and the migration to the cities should add to appliance demand. The same factors should brighten the outlook for furniture, rugs, and other household items.

Some appliance markets may be saturated by the 1950's, however. A few years of high production would fill our homes with refrigerators, for example. However, replacement demand would run to 2.7 million units in 1960 and there would be a demand for 1.3 million refrigerators to equip new houses, so the market would still be bigger than in 1941 when 3.6 million were sold. However, new products must be developed if the industry is to keep up the pace it has set in the past.

TRAVEL

In 1916 the average person traveled 400 miles. By 1940 the average had grown to 2,400 miles, chiefly because of the rise of the automobile. The 20th Century Fund expects this growth to continue because as their incomes rise people spend more money traveling.

A good share of the increased spending will go to purchases of cars and planes. The Fund estimates that there will be 36 million cars on the road and 100,000 private planes in the air in 1950. The auto industry would be able to sell 5 million new cars a year after 1950 — 4 million for replacement and a million for population growth.

CAPITAL INVESTMENT

Investment plays a crucial role in our economy for two reasons. It is by plowing back part of our annual output that we are able to provide better machines and equipment to keep productivity rising. But the amount ploughed back varies widely from year to year. This unevenness of capital investment contributes to the instability of production and employment.

Because capital investment involves the purchase of durable goods, it can be postponed almost indefinitely when the outlook for profits darkens. Thus, capital investment plummeted from $18 billion in 1929 to $5 billion in 1933, a drop of 72%, whereas consumer spending fell only about half as fast in the same period.

MORE FOR EQUIPMENT

There has been an important shift in the relationship between construction and equipment, the two major types of investment. Before World War I, construction made up around three-fourths of total investment but the ratio declined to less than half in 1935-39. Part of the decline is, of course, explained by the fact that the depression left us with ample plant capacity but provided an incentive to buy more efficient machines to cut costs. Nevertheless, there is a well-defined trend towards allocating an increasing proportion of investment to equipment rather than to plant construction.

CAPITAL INVESTMENT . . .

A little less than two-thirds of total investment goes into industrial plants and equipment. Housing and other consumer construction (hospitals, schools, churches) averaged 27% of total investment during the interwar period. Housing fell from a peak of $6 billion in 1926 to $4.7 billion in 1929 and $600 million in 1933; and it had recovered only half the 1926 volume by 1940.

While other types of investment follow the ups and downs in general business, investment in housing construction follows a cycle of its own. This housing cycle is determined by factors such as the vacancy rate, the level of rents, and that of construction costs, which may not follow the trend of general business. When a drop in general business activity takes place during a declining phase of the housing cycle, as it did in 1929, the result is a deep and prolonged depression.

Government investment, of which the largest component is highways, has been much more stable than other types but it doesn't swing enough weight to stabilize total investment.

Because of the wide fluctuations in capital investment, it's much more difficult to estimate future capital expenditures than future consumer purchases. In order to make a relatively stable forecast, the 20th Century Fund bases its estimates on the long term trend since 1879, which shows a slight decline in the share of total output going to capital investment. Thus, investment under conditions of stable prosperity in the 1950 decade is estimated at 16% of total output as compared with a ratio of more than 18% in the late 1920's. On this basis, estimated capital expenditures work out to $28 billion for 1950 and $33 billion in 1960. Our ability to maintain high employment and rising living standards will depend in large measure on our ability to invest that much profitably in new machinery and buildings.

CAPITAL NEEDS

Analysis of our capital needs lends little support to the idea prevalent during the 1930's that we had reached economic maturity so that there was no way to invest as much as we had in earlier decades. No one has ever made an estimate of how much it would cost to modernize our industrial plant, which is valued at around $200 billion at prewar prices. If as much as a third of it needs to be replaced or rehabilitated, around $100 billion (current prices) of additional investment will be required.

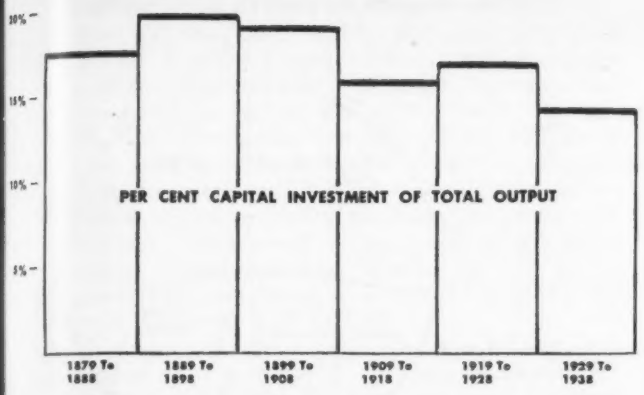
In addition, huge amounts of money need to be invested in housing and public works to raise the serv-

WHERE INVESTMENT DOLLARS GO

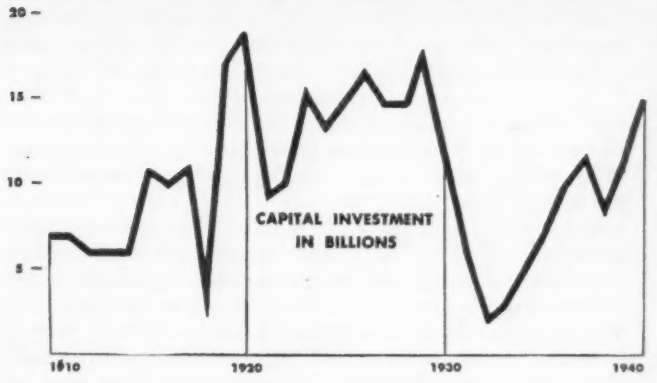
(Figures in Billions of Dollars)

	(Annual Averages)					(1944 Prices)	
	1920-1924	1925-1929	1930-1934	1935-1939	1940-1944	1950	1960
Total Capital Investment	$12,428	$17,186	$8,215	$10,445	$12.340	$27,700	$33,000
All Industries	7,570	10,112	5,272	6,889	8,089	17,800	21,125
Manufacturing	1,996	2,362	1,074	1,610	3,731	4,200	5,025
Food	261	357	194	244		228	273
Textiles	227	212	92	117		175	210
Steel	138	188	110	192		853	1,021
Autos	105	150	78	146		369	441
Chemicals & Petroleum	70	95	68	142		928	1,111
Machinery	—	—	—	28		180	216
Other	510	625	213	409		1,462	1,750
Transportation	1,797	2,303	1,277	1,822	805	4,300	5,100
Commercial	1,196	1,940	777	719	833	1,950	2,300
Utility	693	999	483	422	780	1,500	1,625
Other	1,888	2,508	1,661	2,316	1,940	3,950	4,700
Consumer Construction	3,806	5,557	1,547	2,256	2,912	7,200	8,255
Government Construction	1,052	1,517	1,396	1,299	1,338	2,700	3,620

OVER THE YEARS ABOUT 1/5 OF TOTAL OUTPUT IS PLOWED BACK AS INVESTMENT



BUT THE AMOUNT PLOUGHED BACK VARIES GREATLY FROM GOOD YEARS TO BAD, ACCENTUATING THE SWINGS OF THE BUSINESS CYCLE



ices provided merely to adequate levels. The 20th Century Fund estimates that the cost of a 15 year program to modernize our city streets and rural highways would run to $40 billion. To bring the nation's housing up to minimum standards of health and decency by 1960 would cost $115 billion. To conserve our natural resources and develop our water power would cost $27 billion over a 15 year period.

There seems to be little question that needs exist for all the capital investment we can make for a long time to come. The behavior of investment in the past strongly suggests that the problem is not one of lack of needs but one of finding ways to add to our capital in an orderly fashion. Capital investment has followed the boom and bust route in the past; what is wanted is a high but steady rate of investment.

WARTIME INVESTMENT DEFICIT

Demand for capital goods is stronger right now than ever before, largely because of the backed-up needs arising out of the war. Here is how wartime expenditures for capital goods which can be used in peacetime production compared with expenditures in the last 5 years of both the 1920's and 1930's: (Figures in billions of dollars)

	1925-1929	1935-1939*	1940-1944
Total Capital investment	$86	$65	$49
Industrial	51	43	32
Manufacturing	12	10	14
Metals, chemicals, machinery, petroleum	6	6	11
All Other	6	4	3
Commercial	10	5	3
Railroads	5	3	3
Electric power	5	3	3
Consumer Construction	28	14	12
Public Works	7	8	5

*Adjusted to Wartime Prices

Wartime restrictions held investment in all civilian lines far below what would be spent in prosperous peacetime years. Thus, there was a backlog of investment needs at the end of the war which ran to more than $30 billion, if the 1925-1929 demand can be taken as typical. Whatever the precise size of the backlog, it is clearly great enough, when added to the normal yearly demand for new investment, to keep the heavy goods boom going for some time to come. The test of our ability to stabilize capital investment will come later.

There is also a huge foreign demand for American capital. How far we will go toward meeting this depends largely on whether international political and economic conditions are stable enough to make private foreign investment a good risk.

If we invest abroad in the same proportion we did in the late-1920's, our foreign investments will total $1.6 billion during the year 1950 and $1.5 billion in the year 1960. This will mean a net increase in our foreign holdings of $15 billion during the 1950's, raising the total of such holdings to about $25 billion, as against a total of $10.6 billion in 1940.

To make that much foreign investment pay out, an expanding volume of world trade would be required. Foreign nations would have to get enough dollars not only to pay for goods they bought from us but also to pay interest and dividends on U. S. investments. If our overseas investments increase to $25 billion by 1960, annual interest and dividends owed us will run to almost $1¾ billion.

To pay us that much, foreign nations would have to sell much more in the U. S. than ever before. The 20th Century Fund calculates that imports of $7.3 billion in 1950 and $8.1 billion in 1960 would provide other countries with the dollars they need. Imports ran to $2.5 billion in 1940 so we would have to buy 3 times as much abroad to keep expanding our foreign investments.

With good business, U. S. demand for imported goods should be well above prewar. Rising living standards will widen the market for such consumer items as British tweeds and French perfumes. Moreover, we will need to import more raw materials than ever before because we used up our natural resources at a prodigious pace during the war.

NEW INDUSTRIES

The new methods, materials, and products developed during the war may well have a more profound and lasting effect on future capital requirements than the backed-up demands accumulated in wartime. Here are some of the wartime developments which may have important peacetime applications: new chemical processes and products including synthetic rubber, plastics, synthetic fibers and fabrics; new food products and new methods of food processing; new uses for glass, plywood, and the light metals; tremendous advances in aviation; and new applications of atomic energy and fissionable products in power production and medicine.

Large capital expenditures will be required to push these developments further and adapt them to civilian use. New businesses and perhaps entire new industries will grow up, adding to the demand for capital goods for many years.

THE COST OF GOVERNMENT

To the traditional certainty of death and taxes can be added the certainty that the cost of government will take a much larger share of national income than ever before in peacetime. After the Civil War and again after World War I, federal expenditures moved up to a level four times prewar. And it is already clear that World War II is going to have about the same effect.

In 1940, federal, state, and local governments spent $19 billion, of which a total of $2.2 billion went for national defense, veterans, and interest on the war debt. By 1950, the 20th Century Fund estimates that all governmental units in the U. S. will be spending more than $45 billion. Federal expenditures are estimated at $27.6 billion in that year as against $9 billion in 1940.

Part of the increase is explained by higher postwar prices. Adjusting for price changes would reduce the 1950 figure from $45 billion to $33.5 billion. This is still 80% above the 1940 level. Increased expenditures for public works, social insurance, and schools explain another small part of the rise.

But costs arising out of the war are by far the most important factor. Military and veterans' expenditures and interest on the war-swollen national debt will add up to over $17 billion in 1950. This is only 10% less than total government expenditures in 1940.

The only major category of government expense which would be lower in 1950 is welfare. With high-level employment and more social insurance, relief and other welfare costs should run to $2.5 billion in 1950 as against $3 billion in 1941.

The following paragraphs describe important trends in the major items of government expense.

MILITARY

The 20th Century Fund assumes that we will maintain an armed strength of 2 million men (including trainees) and that it will cost $3,300 to equip and maintain each man, so total military expenditures will run to $6.6 billion. But even if we decide to maintain a smaller armed strength, the total cost might easily be at least $6.6 billion because the present per serviceman cost of over $6,000 a year may not decline.

AND GOVERNMENT ...

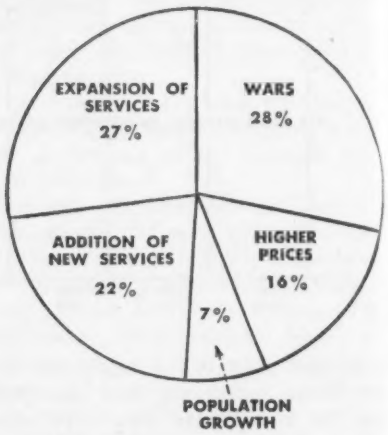
VETERANS

It will cost at least $2.9 billion to take care of veterans in 1950 even if benefits are not increased. That's 5 times the 1941 cost. Pensions for World War I veterans rose steadily from $116 million in 1924 to over $300 million in 1945. That rise will continue for another 20 years. By far the largest expense will be for World War II pensions which are already costing $900 million. Disability and death benefits will cost about $1¾ billion in 1950; hospitalization will add another $250 million; and insurance $150 million.

SOCIAL SECURITY

Future expenditures for social security will depend on whether steps are taken to extend coverage and liberalize benefits. Over 60 million people are now covered so the cost is certain to increase rapidly as more of them begin to draw payments. With high-level employment in 1950, estimated old age and unemployment benefits under the present system would run to over $5 billion. Expansion of benefits, as recommended by the Social Security Board, would raise the cost to over $9 billion.

WHY THE COST OF GOVERNMENT HAS INCREASED. The $25.6 billion increase in cost from 1913 to 1941 was due to:



PUBLIC WORKS

Even an economy-minded Congress is almost certain to go along with expenditures for highways, airports, waterways, flood control and conservation. Thus an increase in expenditures for transportation and natural resources from less than $2.5 billion to over $5 billion in 1950 seems probable.

SCHOOLS

Education ranks third among all government expenditures. In 1941 we spent almost $2.5 billion—10% of all government dollars—on schools. Teachers' salaries account for almost three-quarters of the total cost so the trend towards higher salaries will boost the nation's bill for education.

WHERE TAX DOLLARS GO

(Figures in Billions of Dollars)

	1913	1932	1941	(1944 Prices) 1950	1960
All Government Expenditures	2.5	12.4	23.1	45.5	50.7
Federal	0.7	4.3	12.9	27.6	28.6
State	0.2	1.8	3.6	7.0	9.3
Local	1.6	6.3	6.6	10.9	12.8
Military	0.27	0.7	6.1	5.6	6.6
Veterans	0.18	0.8	0.6	2.9	3.2
Interest	0.15	1.3	1.7	7.9	8.1
Social Insurance	—	0.2	1.9	7.7	8.7
Welfare & Health	0.31	1.5	4.1	4.0	4.1
Education	0.65	2.5	2.7	3.7	4.3
Public Works	a.	a.	a.	5.6	7.1
Transportation	0.40	1.9	2.0	1.8	2.7
Natural Resources	0.03	0.6	1.4	1.2	1.1
Police & Fire	0.19	0.7	0.7	1.0	1.1
Other	0.40	2.4	2.0	3.0	3.6

a. Included in other groups.

NATURAL RESOURCES

The war left the U. S. with a depleted supply of most natural resources, and with critical shortages of some of the most essential minerals. Nevertheless, lack of natural resources should not be a limiting factor on our productive capacity. With relatively free access to world markets, we should be able to get all the raw materials we need. And, even if we were denied access to world markets, we could use our low-grade reserves and develop substitutes without causing a prohibitive reduction in our living standards, though everyone would feel the effects in one way or another.

The U. S. economy consumes about a billion and a half tons of raw materials each year, or about 11.5 tons per person. Of this 3.5 tons are coal, 1.5 tons are petroleum, and iron and copper ore each contribute about a half a ton. In 1939 the value of unrefined minerals output was $4.2 billion and 2% of all workers were engaged in mining or lumbering.

FUTURE REQUIREMENTS

The level of industrial production projected by the 20th Century Fund would raise minerals requirements a third above 1940 by the year 1950 and 50% above 1940 a decade later. Here is how natural resources requirements in the 1950 decade would compare with 1940 and the wartime peak: (Index numbers, 1940 equals 100)

	Wartime Peak	*1950*	*1960*
All minerals	138	133	151
Metals	157	117	126
Fuels	130	141	164
Other	141	128	142
Lumber	126	93	76
Electric Power	159	173	224
Manufactured Gas	120	94	75

The capacity of our supplies of natural resources to support future levels of output cannot be determined with any great accuracy. It will depend on the size of our reserves and on our ability to use supplies more economically and develop substitutes.

H THE
OURCES
ILABLE . . .

Because there is no way to measure these factors with any degree of precision, all estimates of the number of year's supply are subject to wide errors. However, such estimates are useful in directing attention at those resources where every effort should be exerted to develop new supplies, substitutes, and more economical methods of use.

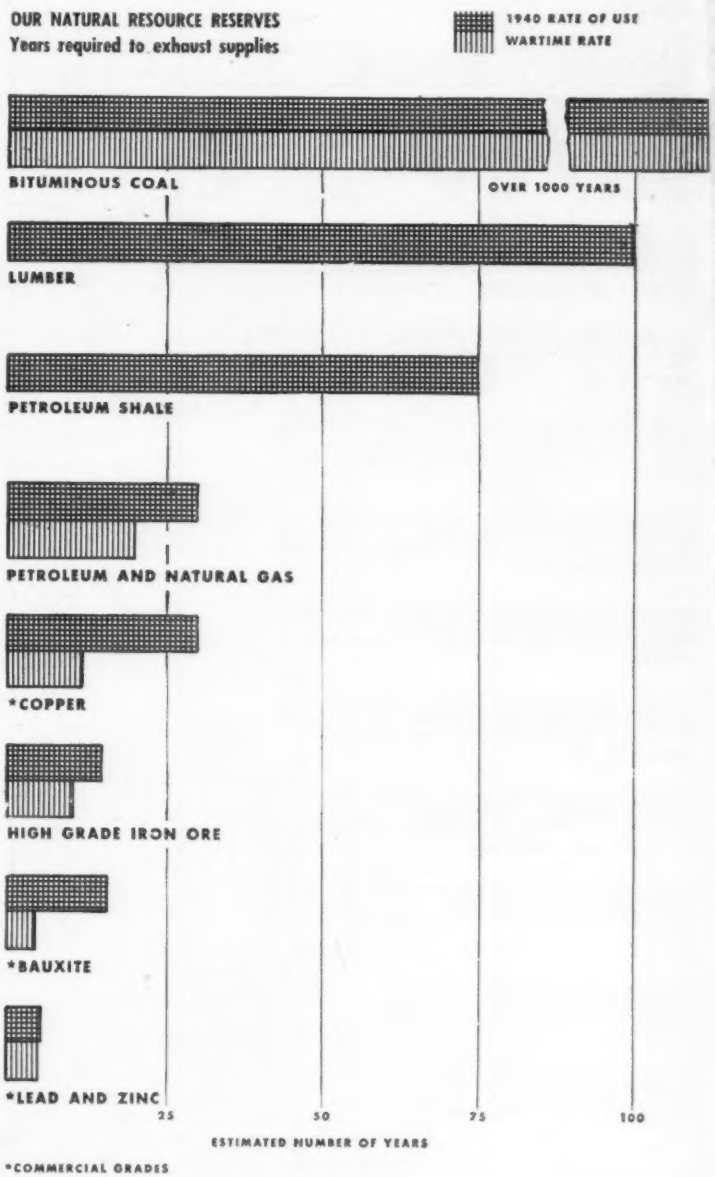
BIGGEST PROBLEMS: LEAD AND ZINC

Commercial grades of zinc, lead, and bauxite will be exhausted before 1960 even if the rate of use is cut to half the wartime rate. Supplies of petroleum and natural gas—which furnish 40% of our energy—will last longer than 20 years but their partial depletion will raise many technical and economic problems long before that time. Possible exhaustion of high-grade deposits of such minerals as iron and copper in the foreseeable future will stimulate development of processes to use low-grade deposits.

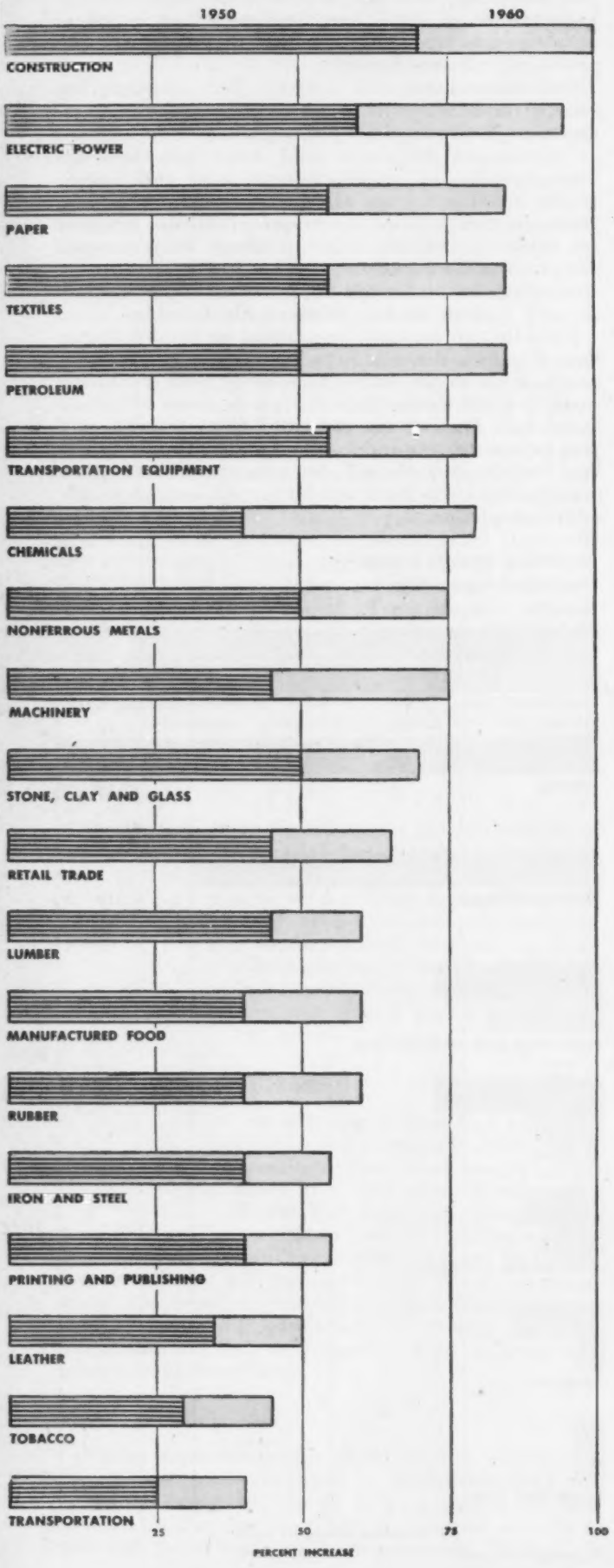
We have been discovering more and more ways to stretch our supplies of natural resources, however. In the case of tin, the electroplating process saves 50% of the tin used in tinplate production. The electric power industry uses less than 40% as much coal per kwh now as in 1920. The development of new materials and new ways of using old materials also expands our resource capacity.

Our bituminous coal reserves are adequate for over a thousand years even at the wartime rate of use, though production costs might rise substantially as inferior coal beds were used. After that, there are huge deposits of sub-bituminous coal and lignite which could carry us along for another thousand years. In comparison, maximum petroleum reserves are minute, adequate only for about 30 years consumption at the current rate. That is why the experts are trying to find ways to produce oil from coal cheaply enough to be commercially feasible.

Even though we have been using up lumber faster than it grows, there is little doubt that enough will be available in the future to meet at least minimum needs. Annual timber growth runs to about 32 billion board feet. But we cut over 40 billion board feet a year before the war and lost another 6 billion through fire, insects, and disease. An adequate conservation program could increase annual growth enough to offset this depletion.



PRODUCTION PROSPECTS: Estimated Percentage Increase in Industrial Activity Over 1940



INDUSTRIAL CAPACITY

At the end of World War II U. S. industry found itself with surplus capacity in some lines and serious deficiencies in others. There was more than enough aircraft, machine tool, and synthetic rubber capacity but not nearly enough sheet steel, copper, or electrical machinery capacity to meet pent-up demands.

War experience showed, however, that industrial capacity can be expanded enormously in a few years, given the need and the funds. Thus lack of industrial capacity should not prove a bottleneck to meeting the demands of consumers in the 1950 decade.

A rough estimate places our total investment in industrial facilities (manufacturing, mining, transportation, and distribution) at $200 billion. Just how much capacity industry as a whole, or any given industry, has is impossible to measure.

Capacity is a most elusive concept. In a technical sense, the capacity of an industry is the combined production of all its plants working 24 hours a day, 365 days a year, less an allowance for repairs, breakdowns, and other technical factors. Actual capacity is far less, however. Some facilities are obsolete or high-cost. Supplies of raw materials and components may be insufficient to keep assembly plants running full-steam. Moreover, demand for many products isn't great enough to support round-the-clock production.

PLENTY OF CAPACITY

During the past quarter century, however, experience shows that we have had more than enough overall capacity, and more than enough capacity in almost every industry, to meet all demands. An extensive study showed that even in 1929 only the steel and machine tool industries were definitely operating at capacity.

The growth of productivity as old machines are replaced with new and more efficient ones and as new techniques are developed is one of the main reasons why industrial capacity more than keeps pace with markets. The depression of the 1930's led to a net retirement of about 5% of total manufacturing facilities but manufacturing plants in 1939 could have turned out a quarter more than in 1929 because productivity was a third higher.

Whenever an industry's output begins to approach technical capacity, it becomes profitable to purchase new and more efficient equipment to replace or supplement existing machines so that a certain amount of excess capacity seems to be inevitable in a free enterprise system.

Estimates of the level of industrial production in different lines under conditions of high-level employment during the 1950 decade are shown in the chart. They assume that past trends will continue so that they give only a rough idea of what would happen to output in each industry. Unpredictable shifts of consumer demand or new product developments might cause a big change in the pattern of industrial production. Such estimates are, nevertheless, useful in that they provide a clue to lines where the largest increases may take place.

None of the projected increases are so large as to tax our ability to provide enough capacity. This is not to say that there will be no bottlenecks because of lack of capacity for certain components, for instance. However, we should be able to make good in short order any deficiencies of that sort that may develop.

DEMANDS VERSUS NEEDS

Despite the substantial increase in living standards which would be possible with high-level production and employment in the 1950 decade, many U. S. consumers will be unable to buy enough of life's necessities to maintain themselves at a health and decency level. Almost 30% of all families would receive less than $1,000 a year cash income and one-third of this group would receive less than $500.

The 20th Century Fund asked a series of experts to estimate the quantities of food, clothing, housing, medical care, and other things needed to provide a standard of living at a minimum health and decency level. The experts also figured out how much it would cost to bring everyone expected to be below that standard in 1950 and 1960 up to the calculated level. In other words, the estimates show the cost of establishing a "floor" for consumption without disturbing the spending patterns of those who received more than enough income to satisfy the calculated minimum needs.

ESTIMATES OF NEEDS

Any estimate of "needs" must rest upon someone's opinion as to what constitutes "health and decency" in this day and age. In the case of food, the nutritional requirements of a minimum health and decency standard can be determined accurately. In other fields, such as housing and education, even the experts would disagree over what constitutes a minimum standard.

However, what is important is not the precise size of the estimates but their general magnitudes. The conclusion that we would have to spend about 50% more on medical care than we are likely to in 1950 is important even if the experts' appraisals of the deficit range from as high as 60% to as low as 40%.

To fill total needs calculated in this manner would require production of $200 billion of goods and services in 1950 or 13% more than the $177 billion which would be turned out with high-level production and employment. In 1960, estimated production would fall short of needs by 8%. Food accounts for the biggest share of the deficit but needs outrun demand by important margins in housing, medical care, education, and social security.

MEET

MOST ALL

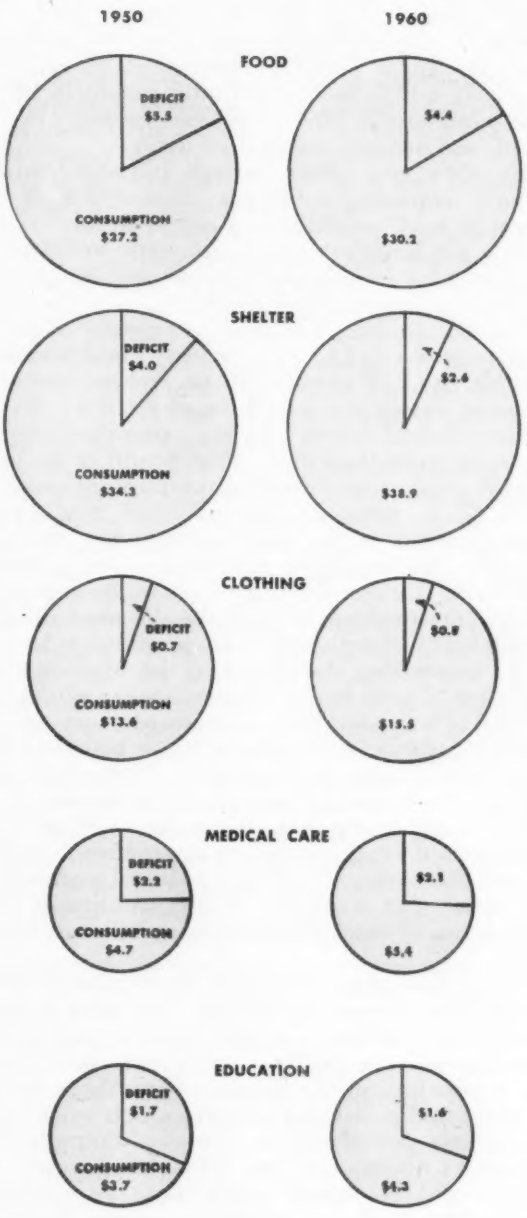
R NEEDS

To provide nutritionally adequate moderate-cost meals for those unable to afford them would add $5.5 billion to the $27.2 billion that would actually be spent on food in 1950. This assumes no change in diets of those with adequate incomes despite the fact that many people in those groups do not eat what they should. If we all ate what we needed, we would consume twice as many fresh vegetables as in 1940, half again as much milk, more fruits and tomatoes; and we would eat smaller quantities of sugar, sirups, fats, and oils. This better diet would cost us less than we will actually spend for food in 1950.

So large a portion of our existing housing is unsatisfactory by any reasonable standards that it would take 10-15 years to provide everyone with adequate housing. One of the reasons why we don't have adequate housing is that many consumers cannot afford to pay enough rent to finance it. Estimated expenditures in 1950 for rent (including the estimated rental value of owner-occupied homes) would run to $14 billion as against an estimated need of $16.4 billion.

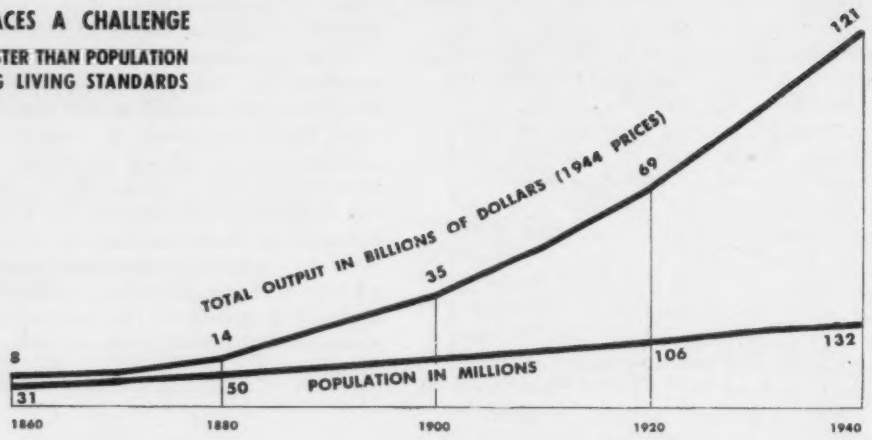
Vast advances in medicine have gone far toward eliminating many diseases and have brought about a steady improvement in the standard of health. However, large numbers of people in the lower income groups cannot afford adequate medical care. Moreover, to supply good medical care for everyone under the traditional fee-for-service basis would cost several times more than consumers have ever spent for medical services even in prosperous years. Development of an effective form of group medicine, however, would make it possible to provide adequate care at a great saving over present costs, according to the 20th Century Fund.

HOW CONSUMPTION WOULD COMPARE WITH TOTAL NEEDS
(Figures in billions of dollars)



THE U. S. ECONOMY FACES A CHALLENGE

PRODUCTION HAS GROWN FASTER THAN POPULATION GIVING PROMISE OF RISING LIVING STANDARDS



The major conclusion of the 20th Century Fund's survey of America's needs and resources is that we have reached a point where we can provide everyone with a decent living and most people with a living which, by any standards other than our own, is positively luxurious. With high-level employment, it would take only a 13% increase in total output in 1950, and an 8% increase in 1960, to lift everyone to a minimum health and decency standard of living.

We have more than enough industrial and agricultural capacity to support that much of an increase in total production. Lack of natural resources should not be a bottleneck, for with world trade on any sort of a reasonable basis we will be able to get all the raw materials we need.

The only limiting factor is the capacity of our labor force to produce. The 20th Century Fund assumes that productivity will advance at the average rate actually achieved during the past 9 decades (18%). But there is no technical reason why we cannot achieve an increase of more than 30%. That would make possible enough production to meet our minimum needs.

The U. S. economy has exhibited two dominant characteristics in the past century. Our productive capacity has expanded at a rate never approached elsewhere. But our economy has also been highly unstable. Our problem is to make the most of our unparalleled technological and productive know-how while minimizing the swings of the business cycle.

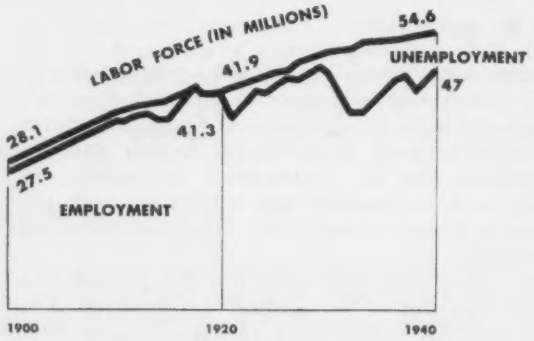
If we can meet that challenge, we can eliminate the specter of want and move on toward constantly rising living standards for everyone. Never before in history has a nation been so close to abolishing poverty and meeting the material demands of its citizens.

This is not to say that solving the problem of maintaining stable and expanding production would solve all our economic, social, and political problems. Nor is it to say that a solution of the problem of keeping our economic machine running on an even keel is at hand.

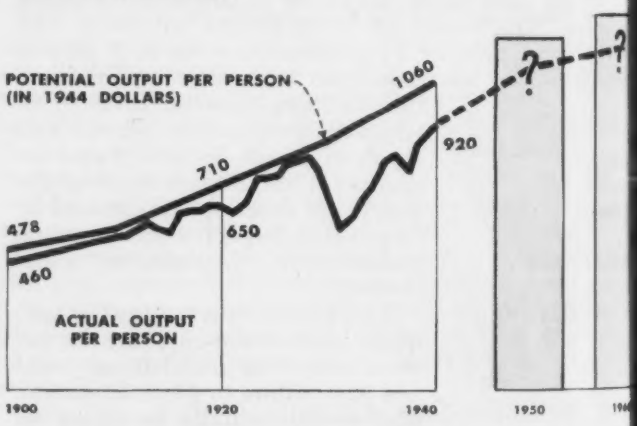
In the first place, the U. S. would not be a utopia even if we achieved the kind of high employment and production the 20th Century Fund is talking about. Many perplexing problems of how to best distribute our production would remain. Then there are a host of social and political problems which would still tax our efforts and ingenuity. Finally, there is the all-important question of how to maintain world peace.

Most people would agree that the problem of maintaining high employment and rising living standards is still far from solution. Our ability to mobilize and direct our economic resources so as to keep our economy running on an even keel has lagged behind our ability to solve technical production problems. Each businessman, each worker, and each consumer must somehow learn to act differently in many ways than he has in the past if we are to solve our number one economic problem.

BUT THE GROWTH HAS FOLLOWED THE BOOM AND BUST ROUTE INVOLVING LONG PERIODS OF MASS UNEMPLOYMENT

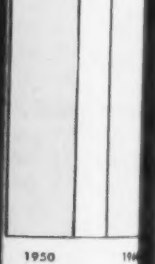


CAN THE ECONOMY PROVIDE STEADY EMPLOYMENT AND RISING LIVING STANDARDS?



Just what changes in our economic life will be necessary no one knows. On our ability to find out these things and put them into practice in the next few years depends our success in meeting the challenge which the 20th Century Fund's study underlines. That challenge is that we have within our grasp the ability to eliminate actual want from the U. S. and to provide more and more things for better living for everyone.

Reprints of this report are available at a charge of 25¢ each to cover the cost of handling and mailing. Address orders to Department of Economics, McGraw-Hill Publishing Co., Inc., 330 West 42nd Street, New York 18, N. Y.


1950

INSPECTORS

Series of four meetings in Denver, Salt Lake City, Twin Falls and Great Falls opens brand new 1947 Code to scrutiny for revision

ALTHOUGH the 1947 National Electrical Code has just reached the hands of electrical inspectors, steps should be started for such revisions as it needs for a new code in 1950. Although the new code has hardly reached its users, some 60 places in it will require either correction, clearer wording or decided change, said Victor H. Tousley, secretary-treasurer, International Association of Electrical Inspectors, to each of four annual chapter meetings in the Rocky Mountain region during April.

The series started at Denver April 3, when the Rocky Mountain Chapter held its annual meeting at Cosmopolitan Hotel under the chairmanship of E. P. Hodges. The second meeting was that of the Utah Chapter at Salt Lake City, April 8, Newhouse Hotel, presided over by Raymond Powell, electrical inspector of Nephi City, Utah. The newest chapter in the IAEI, the Idaho Chapter, met at Twin Falls April 9, presided over by Clyde Hicks, electrical inspector of Nampa, Idaho. The Montana Chapter, meeting at Great Falls, held a two-day session presided over by K. L. Chrysler, city engineer of Billings, Montana, April 11 and 12.

Attending all four of the meetings, besides Tousley, were James S. Mahan, chairman of the IAEI membership committee, Chicago; Lester Johnson, General Electric Co., Salt Lake City, and William A. Cyr, associate editor, ELECTRICAL WEST, who spoke on *Unsafe Appliance Sales Control.* Sam Rosch, manager, insulated products development department, Anaconda Wire & Cable Co., Hastings-On-Hudson, N. Y., addressed the Denver, Salt Lake City and Great Falls meetings. William L. Gaffney, secretary, Northwestern Section, IAEI, Tacoma, addressed the Salt Lake City, Twin Falls and Great Falls meetings. While H. G. Ufer, Western superintendent, Underwriters' Laboratories, Los Angeles, attended the Salt Lake City meeting, he only spoke to the Montana Chapter meeting.

A special guest at the Rocky Mountain Chapter meeting at Denver was A. H. Welklin, electrical inspector of Indianapolis and president of the Western Section.

Individual accounts of the programs at each of the meetings follow. However, since the ground covered both for Tousley and Rosch was similar in each of the meetings, and in each case was a major feature of the program, separate accounts of these talks are reported here.

Attendance at all meetings showed a substantial increase over last year. The too-full programs for the time available drew a suggestion from Tousley that each chapter plan a two-day session next year to give full opportunity for code change discussions and so as to hear significant talks on new developments or important trends in relation to inspection.

Tousley Exposes Need for Changes

THAT there are already 64 memoranda on a personal copy of the 1947 Code on which he keeps notations of errors, corrections to be made or changes that are necessary, Victor H. Tousley told each of the meetings. Only two small typographical errors have been found. One of these is a reference in Section 1109 to a Section 3107, which does not appear in the code at all. Tousley then discussed many of these indicated needs for revision, large or small.

Considerable time was given to discussing the requirement in 2124b for a 3-pole receptacle at the home laundry location, presumably for grounding laundry equipment. Tousley said, however, that there was nothing actually written to require grounding of it and that manufacturers were not required to equip washing machines with 3-wire cord. This will have to be clarified. The subject of grounding of portables, Tousley announced, has just been studied by a special committee which recently made a report recommending a new type of grounding receptacle. An official interpretation has been made that in apartment houses where there is located a general laundry room, a separate receptacle for washing machines need not be provided.

Although multiple service assemblies are permitted in 2301 for a series of stores, an official interpretation declares that this does not apply to a similar vertical assembly, such as in an apartment building.

In 2322c, relating to clearance of service drops, the wording and titling is a poor selection and needs changing.

Tousley also declared that more space is necessary in motor terminal boxes for making connections. In many cases nine wires must be connected and the overcrowded box cannot be covered. This is being recommended to the Codes and Standards Committee of NEMA.

Lock nuts are required both inside and outside an outlet box wherever an insulating bushing is used, no matter what the circumstances are, according to 3736b.

Switches controlling fluorescent lamps, as in 3814c, should be required to have twice the rating because of the inductive load.

Too literal an interpretation of 6403 would prevent use of a vacuum cleaner cord from one room to another. This was not the intention. In fact, the entire cord situation needs revision, Tousley said.

In wiring of continuous rows of fluorescent units, Article 4150 permits use of the fixture raceways for a single branch circuit. An official interpretation has been made that this may be either a 2-, 3- or 4-wire circuit.

An important change in the code is Article 4322c-1, which applies to any motor of 40° temperature rating, whether open or not.

In 4196, instead of using a single midpoint grounded transformer for neon or electric discharge lighting, two end-grounded transformers may be used in order to shorten the length of high-voltage cable required, but there is some question as to what kind of insulated conductor can be used for the grounding conductor.

Oil-burner motors are the cause of a number of fires. The practice of allowing a transformer for the oil-burner control on the same circuit as the oil-burner motor leaves the motor without protection and needs to be clarified.

Article 2544 permits the use of transformers on a roof if held in a pan

or enclosure that is capable of taking the entire volume of oil. The code says it may be drained or not. However, because rain might fill the basin, the rule should require a drain.

On 3-phase hoists of a monorail type, the code recognizes two insulated conductors and allows the crane frame for the other conductor. However, another section of the code denies the right to use any part of the building frame as a grounding conductor. Thus the crane monorail would have to be insulated.

Although dry cells or storage batteries are seldom used for pipe organ operation any more, the section of the code relating to this, Article 6502, has not been changed and should be.

The question whether the wire tables for numbers of wires in a conduit applies to signal wires has brought the official interpretation that as many signal wires as wanted can be run in a single conduit.

Motor and control wires for the motor circuit can also be carried back through the same conduit as that which contains the feeder wires.

An error in Table 20, relating to size of fuses on over-current protection, needs to be corrected for both 26 and 28 amp. The table should read No. 8 wire in both cases. An error has also been noted in the diagram on page 366.

Experience with type TW wire where gasoline is present has shown that the gasoline attacks the synthetic coating on the wire. It had been assumed that type TW would be proof against oil and gasoline as well as moisture. However, lead-covered wire is no better. Tousley said nothing presently available is satisfactory in the presence of gasoline.

In article 3483, electric metallic tubing is permitted where corrosive fumes, exposure, etc., is present, provided it is a corrosion-resisting type of tubing, but at present there is none.

Article 3809 requiring covering of most conductive materials, needs some correction.

Clarification is needed in regard to permitting a 50% conduit fill in rewiring of old structures with new wires of thinner insulation, taking into account the thinner insulation

Another point which the code is not clear upon is whether theater aisle lights should go on the emergency system.

Despite the controversy over common neutral, it is not permitted in the code for building wiring but is still recognized for outdoor sports lighting and can be used on a single pole or structure as long as the neutral has two times the carrying capacity of the circuit wires. This is in Article 7312.

Rosch Tells of Plastics Competition

WHETHER new synthetic materials will be used on a pair of ladies' shoes which sell for $26, or sold to wire manufacturers at far less profit to make wires and cables, expresses the competition for synthetic materials that can be expected in the next few years. The marvels of chemistry have brought new materials, but they have also brought a competitive struggle as to who will use them. Such in effect was the theme of the message delivered with humor and drama by Samuel Rosch, director of research, Anaconda Wire & Cable Co. to three of the inspector meetings.

Sam Rosch and rubber

The world is not getting any larger and mankind is denuding it of its minerals and chemicals. Yet the population increases by 140,000,000 each ten years. The needs of war caused a great shift to synthetics, produced from common materials, through either catalysis or polymerization.

Rosch explained catalysis by a simple analogy to matchmaking, and polymerization as a chain of minute particles made stronger because of their interlinkage. By quick diagrams and simplified chemical formulas, he demonstrated how many varieties of materials can be produced from simple gases by the introduction of a catalyst.

He distinguished between two types of plastics. The thermoplastic materials are those which soften with the application of heat. Thermosetting plastics are materials which harden or vulcanize with heat.

In the course of his talk he showed many samples of oils, synthetic rubbers, fibers made of milk, glass, nylon and other materials. He spoke especially highly of neoprene, synthetic rubber which resists most chemicals, oils, heat, moisture or water, gas, gasoline, radiation and sunlight, and said he hoped to see all flexible cords made with neoprene jackets in the near future. This, he said, would be an answer to the problem of cords.

All type T or synthetic covered wires are not the same, he declared, due to the plasticizer used in coating them. With a trend to higher temperatures, the use of newer materials which are resistant to heat can be expected. The thickness of wall insulation is not important as long as the plastic is tough enough, resistant enough to abrasion or deteriorating effects and is a good dielectric. The dielectric qualities remain the same in a plastic as long as the material remains the same.

He showed samples of a silicone rubber-insulated wire which resists temperatures far beyond those of the ordinary synthetics, and a whole new family of products made from fluorene gas instead of hydrogen, which promises materials impervious to almost every abuse and temperature. As yet these products are high in price and difficult to process, but their demand will bring better methods of producing them at cheaper prices.

He also showed some cable jackets made of semi-conducting rubber, which act as a shield for the cable itself. He predicted further experiments in still higher frequencies and told how extremely high frequencies had been transmitted over long distances on a cable made entirely of neoprene, without any metal conductors in it at all.

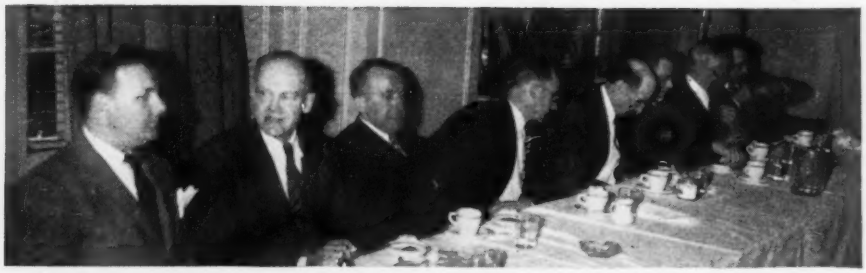
Buna-S has had the best operating record of any insulating material thus far used on wire, said Rosch, and can be expected to find wide usage in the future.

Denver Invites Western Section

DENVER may be the next meeting place of the Western Section, International Association of Electrical Inspectors, in 1948. E. P. Hodges, chairman, Rocky Mountain Chapter, declaring that it was time that Denver entertained the Western Section, submitted the proposition to the Rocky Mountain Chapter and a motion to invite the section when it meets in Montreal in September was unanimously passed. V. C. Moulton, secretary-treasurer, made an analysis of the hotel situation and submitted the dates of Sept. 14 to 16 or 27 to 29 in 1948 as available on the convention and tourist bureau calendar.

A. H. Welklin, president, Western Section, a former army buddy of Moulton, expressed the hope that the meeting could be held there next year.

Thompson Christensen Hall



Dunham Hubbard Rosch Christensen Moulton Hodges Tousley Welklin

He commended the aggressiveness of the Rocky Mountain Chapter in its carrying on of a code school, saying that this was a pattern for many other regions to follow. He declared the chief problem today is to provide inspection in rural areas now being reached for the first time by electricity. The difficulty of providing personnel for inspection, even in states having a state law, was cited by him as something that the association should try to solve. Fires in rural communities usually result in a total loss, because of inadequate fire protection

The Denver program was streamlined to two principle features, the code discussion given by Tousley, and reported elsewhere, and the amusing and interesting talk on *Synthetics and Plastics and their Relation to Wires and Cables*, by Sam Rosch, also reported elsewhere.

A panel consisting of Tousley, Welklin, Johnson and Moulton answered questions from the floor to conclude the session. Among the questions answered were some in relation to the following:

1. Running two services in the same conduit.
2. Voltage drop on lighting and power circuits.
3. Whether black enameled conduit would resist corrosion better in a packing plant installation than galvanized conduit.
4. The recommendation by REA for a 5-wire meter loop in the same conduit on a pole.

W. A. Cyr outlined the purpose and the use of a manual just released by the sales control committee of IAEI, instructing a community how to go about enacting an unsafe appliance control ordinance. It was announced that Denver is about to have such an ordinance submitted to its city council by the Rocky Mountain Electrical League and that Greeley, Colo., had incorporated sales control in a revision of its wiring ordinance last year.

Officers elected at the conclusion of the meeting were as follows: chairman, Harvey Christiansen, electrical inspector, Rapid City, S. D.; first vice-chairman, Robert L. Thompson, state electrical inspector, Albuquerque, N. M.; second vice-chairman, A P. Hall, Fort Myers, Colo.; secretary-treasurer, V. C. Moulton, Mountain States Rating Bureau, Denver; executive committee, active inspectors, E. P. Hodges, Public Service Co. of Colorado, meter superintendent, Denver, retiring chairman; V. L. Markham, Colorado Springs city inspector; T. P. Treadwell, Fort Collins, inspector; D. J. Goodhue, La Junta, Colo.; John Disbrow, Boulder, Colo., inspector; manufacturers, Austin Dunham, Anaconda Wire & Cable Co.; Harold Vaughn, manufacturers' representative; utilities, R. K. Koulk, Home Gas & Electric, Greeley; contractors, Ralph Johnson, Sturgeon Electric Co., Denver.

Utah Chapter Looks To 1948 Meeting

THE Utah Chapter will have to wait until 1948 to entertain the Northwestern Section for the annual fall meeting, it was explained at the opening session of the Sixth Annual Meeting of the Utah Chapter at the Newhouse Hotel, April 8. Soon after Raymond Powell, electrical inspector, Nephi, chairman, opened the meeting and D. J. Wolters, secretary-treasurer, had made his report, a message from R. J. Larrabee, president of the Northwestern Section, was read, and W. L. Gaffney, secretary-treasurer of the section, picked up the theme of Larrabee's message.

At the Boise meeting last year it had been decided to hold the next meeting in Salt Lake City, but due to crowded hotel conditions during the centennial year, a mixup in the arrangements had caused the officers of the Northwestern Section to ask Eugene, Ore., to hold the meeting this year, and the Lane County contractors Assn. in Eugene has agreed to sponsor the Northwestern meeting there Sept. 22-24.

Gaffney recommended that a definite schedule of rotation of section meetings among the five states in the Northwestern Section be considered. This would aid the officers to plan anual meetings and to assign the responsibility to each state group far enough in advance so that they can make adequate plans. Under this scheme, the 1947 meeting would be in Oregon, 1948 in Utah, 1949 Montana, 1950 Washington, 1951 Idaho and 1952 Oregon again. With the British Columbia inspectors forming a chapter, it might be advisable to include that part of Canada in the meeting schedule, he said.

Gaffney recommended consideration of the forming of divisions within a chapter in order to provide small meetings at convenient locations for study of code and wiring matters, citing the success of the Tacoma division of the Puget Sound Chapter.

He also requested that when the directory of membership and committees appears, each one on a committee begin studying the particular section of the code assigned to his committee. He asked that each submit any recommendations for changes to the code clearinghouse committee. He likewise asked that, wherever possible, 150 mimeographed copies of these suggestions be struck off and brought to the annual meeting for distribution and study.

J. S. Mahan, national membership chairman, appealed for more action in getting memberships and told how members receive booklets, transactions and directories which cost the association some $4.88 per member, although it only receives $1 from active and $2 from associate members. Cooperating members make up the deficit.

The article of the National Electrical Code dealing with wires, article 310, was discussed by D. E. Karlskind, district engineer, U. S. Rubber Co., San Francisco. He described the changes made in Type R wire to give it greater temperature range. He discussed the RU or latex wire and the Type T, formerly SN, thermoplastic wire and its companion TW, which is mosture resisting. The new wires have a thinner wall with a higher grade insulation.

Wolters Grant Meyers Christensen

Wolters Powell Stayner

He then discussed aluminum wire, as included in the recent code, providing that it carry only 84% of the current for the equivalent size of copper. He spoke of material shortages, such as cotton for braid, rubber, lead and copper, and how these had caused changes in the standards and habitual usages. Many wire manufacturers will produce aluminum wires, said Karlskind, but it will not necessarily be their policy to push aluminum. Rather, it is a matter of using the aluminum or shutting down the wire mills, in some instances.

V. H. Tousley, IAEI secretary-treasurer, discussed code changes as reported in another column. He also asked patience from those who had ordered leather-covered Codes. They are in the process of being printed and bound and have been delayed due to printing difficulties.

The afternoon session was opened by W. J. Smith, Salt Lake City fire marshal, who described how his department and the electrical department coordinate their activities in the prevention of conditions which may cause fires or accidents. The two things that cause most trouble, he said, are improper fusing and overloading of outlets. "Help us to put out the fire before it starts," he said is the motto of the fire prevention bureau and that it likewise is the motto of the electrical inspection department.

J. Hyde Stayner, Utah Power & Light Co., asked that definite action be taken to request the 1948 annual meeting in Salt Lake City, and D. J. Wolters made a motion, which was passed, inviting the section to hold its meeting next year in Salt Lake City and to issue an invitation to the Southwestern Section for a joint meeting at that time.

Samuel Rosch, Anaconda Wire & Cable Co., gave the talk on synthetics and plastics and their relation to wires and cables, which is reported elsewhere.

Before the meeting closed, W. A. Cyr, associate editor, ELECTRICAL WEST, announced the IAEI sales control committee report recently published, setting forth the recommendations for having unsafe appliance ordinances sponsored and passed and giving directions for their administration, once passed. There was some discussion as to details of enforcement.

At the election of officers, Clarence F. Grant, meter department, Utah Power & Light Co., was elected chairman; T. E. Myers, chief electrical inspector, Ogden, vice-chairman; L. John Christensen, second vice-chairman, and D. J. Wolters was re-elected secretary-treasurer. The new chairman, Grant, recommended that a program committee be appointed to work up programs for chapter meetings and that a study of the new code be undertaken.

Idaho Chapter's First Big Meeting

TO TWIN FALLS from all parts of southern Idaho came some 85 electrical inspectors, contractors, wiremen and utility and wholesale representatives to launch the newly formed Idaho Chapter of the International Association of Electrical Inspectors on its first annual meeting, April 9. The morning session, held at the Idaho Power Co. auditorium, overflowed the meeting room. It was called to order by Clyde Hicks, inspector at Nampa, Idaho, chairman of the chapter. The mayor of Twin Falls welcomed the group, and William A. Hopper, Gem State Electric Co., Boise, electrical contractor, and one of the prime movers in the organization, responded and explained the position of an inspector as that of an umpire to the industry and the advocate of the public.

The morning session was devoted to chapter business and election of the following officers: chairman, Clyde Hicks, electrical inspector, Nampa; vice-chairman for District 1, Carl H. Van Hardenberg, Coeur d'Alene; vice-chairman for District 2, Virgil Burrows, Idaho Power Co., Boise; vice-chairman for District 3, A. E. Dickey, electrical inspector, Twin Falls; vice-chairman for District 4, I. C. Hansen, electrical inspector, Idaho Falls; secretary-treasurer, Dea Board, Afton-Lemp Electric Co., Boise.

After lunch at the Park Hotel, the afternoon meeting was resumed there. L. B. Johnson, General Electric Co., Salt Lake City, explained the several underfloor wiring methods covered in the National Electrical Code. He made the point that an underfloor duct system can often be used even in a modest office installation to provide utmost flexibility for the moving of desks and furniture and still provide telephone and electric outlets wherever needed. He concluded the talk with a number of slides showing steel floor duct systems in modern steel frame buildings.

James S. Mahan, mmbership chairman, IAEI, spoke briefly on the need for members and congratulated the Idaho chapter on its acquisition of a large membership since the Northwestern Section meeting last year.

W. L. Gaffney discussed the same topics found reported in the Utah Chapter meeting relative to rotation of annual meetings of the section, formation of divisions of the chapters and article committee reports.

That the electrical inspector need not be in the negative position of a gumshoe man, but can be a positive influence as guardian of public safety, was the theme of a talk by W. A. Cyr, associate editor of ELECTRICAL WEST, San Francisco. The "thou shalt not" motive is psychologically one which arouses antagonism and resistance. Therefore, the inspector needs to sell his public on the necessity for safe installation and usage of electricity. This task can be done in several ways and the electrical industry, if enlisted, will assist the inspector in this educational program.

Cyr then explained the report of the

At Twin Falls meeting: left, J. S. Mahan shows samples; right, Clyde Hicks presiding at opening session

sales control committee in the preparation of a manual to guide cities and states in the enactment of unsafe appliance regulation. He quoted portions of it to illustrate the reasons which can be applied to sell the idea to the public, to dealers, to the city attorney and to the council or legislative body and to the industry.

V. H. Tousley followed by explaining that the National Electrical Code is drawn up by inspectors and other branches of the industry as a recommended code of practice. It has no legal standing except when given such by enactment into city or state ordinances. It is not written and prescribed by the United States government or any other legislative body.

He likewise declared that electricity is second only to matches and smoking now as the cause of fires and in most cases the losses from electrical fires are greater. With more extensions of electricity into rural areas and more usage of electricity, the problem of holding down fires and accidents becomes a bigger one. He also discussed membership in the IAEI and the means whereby suggestions for changes in the National Electrical Code are proposed by individuals or chapters and sections of the IAEI.

George C. Heubener, secretary, Idaho League of Municipalities and for 24 years himself a city attorney, spoke of the legal phases of electrical inspection, with particular reference to Idaho law. He told of the passage in 1941 of an act to permit the adoption of codes such as the National Electrical Code by reference. He likewise spoke on the recently passed House Bill 114, regulating the installation of electrical equipment in the state of Idaho. The bill provides for licensing of contractors and journeymen and sets up an examining board. It provides that the NEC shall govern in all places where no city or building code is in force. He concluded by impressing that it is the duty of the municipal officers to sell the purpose of their codes to the public, since they are much more necessary today than they were ten years ago.

The afternoon session concluded with a question and answer panel discussion conducted by V. H. Tousley, William A. Hopper, W. H. Gaffney, and L. B. Johnson. In this session Tousley covered many of the points which he reviewed in a complete talk at the other meetings and reported elsewhere. The questions asked from the audience were related to the use of aluminum wire in corrosive locations, the fusing of No. 12 wire, a question as to what kind of wiring could be used with cinder concrete block construction, and various phases of cold-cathode lighting.

The motion picture, *Summer Storm*, was presented by Westinghouse Corp.

That evening at the dinner, attended by some 120 membrs of the industry, Eli Weston, attorney who had drafted House Bill 114, made an analysis of the bill and R. C. Lewis, commissioner of law enforcement for Idaho, discussed the methods by which this state code could be activated.

Montana Group Will Work for State Law

PRACTICALLY a convention was the two-day meeting of the Montana Chapter April 11 and 12 at the American Legion Hall, Great Falls, Montana. The program included many more speakers than the other chapter-meetings. These added considerable depth to some of the topics covered, such as motor applications, appliance grounding, circuit breakers and panelboards, wire problems and explosion-proof equipment.

K. L. Chrysler, city engineer, Billings, Mont., chairman of the chapter, presided over the opening meeting, while Ralph Grant, first vice-chairman, presided over the subsequent meetings and was elected chairman at the conclusion.

E. E. Lacy, Westinghouse Electric Corp., Butte, described first the types of electric motors in general use in both the fractional and integral sizes and their methods of starting. He then described a new design of motor developed by his company to provide compactness, ruggedness, ease of maintenance, and better and quieter operation. The motor makes use of pressed steel punching rather than cast parts, and a new factory at Buffalo will soon have a capacity of 40,000 motors a month.

The same talk on public relations of an inspector given in the Idaho meeting was presented by William A. Cyr, associate editor, ELECTRICAL WEST, San Francisco, to the Montana meeting.

John Cromer, commercial engineer, Montana Power Co., Butte, described the new things in lighting that can be expected whenever the difficulties of material shortages and strikes are overcome. Among these is a new certified lamp program to take the place of the former IES lamp certification. Office lighting and lighting in the home with built-in perimeter illumination, from flush of surface mounted slimline units can be expected. Ceiling spotlights will also be used through small openings in the ceiling to drive 140 foot-candles of light on the reading surface, 26 inches from the floor.

Cromer described a new circuit for fluorescent lights, using a PAR spot-lamp of 105 volts in lieu of a ballast in a 240-volt circuit. This arrangement saves weight and cost and provides both general fluorescent illumination and directional spotlighting in a single unit. He also described cellular ceilings, which enable the making of changes in lighting arrangements and intensities above the louver without altering the appearance or the ceiling brightness as seen from the floor.

In streetlighting he showed reflectors for street series lamps and a new mercury basin type unit which uses either a 10,000- or 20,000-lumen mercury lamp to distribute a broader pat-

Clune Chrysler

Shevalier Larimer

tern of light on the pavement with less glare as seen by the motorist.

Another new lighting device will be a fixture using three slimline lamps to light outdoor poster boards.

Sam Rosch, Anaconda Wire & Cable Co., opened the Friday afternoon session with his talk on synthetics. This is reported elsewhere.

The controversial subject of grounding portable appliances was discussed by L. B. Johnson, General Electric Co., Salt Lake City. He mentioned the recently published report of a special committee to study the problem, in a recent *News-Bulletin*. He reviewed the provisions in the National Electrical Code which call for grounding of fixed equipment. Portable equipment, however, has presented an especially difficult problem because no receptacles have been designed that are satisfactory for the purpose. The use of range plugs on portable tools has not proved satisfactory because they are not designed for grounding.

The 3-pole receptacle sometimes used is designed for use with 220 volts and can be mistaken for such an outlet with disastrous results. Frequent misuse of the present day cord and plug and the large number of deaths and serious injuries caused by using portable saws, welders, etc., without proper grounding of the frame, has brought a demand for the design of suitable receptacles.

In the 1947 Code a receptacle, presumably for grounding a washing machine, is required at a laundry location, but no satisfactory receptacle for the purpose has yet been manufactured, and the makers of washing machines are not equipping their appliances with 3-conductor cords for the purpose.

Johnson described the receptacle now being developed for this purpose. It will be of a completely new type and the grounding slot in the receptacle will either be a large square or a round opening which cannot be plugged into by either of the hot legs. Johnson told why it was dangerous to use the neutral conductor for grounding except in cases of fixed equipment, such as electric ranges.

Asked to talk on state legislation, W. L. Gaffney, secretary-treasurer, Northwestern Section, described the recently passed Idaho law and the experience in the state of Washington. The Idaho law, he said, appeared to him to be mostly licensing and examination. Although it requires work to be done according to the National Electrical Code, there is nothing set up in it for inspection or inspection fees. He said state inspection requires an educational campaign to the public.

A point he made was that the home owner who wants to do his own wiring should not be stopped if he is capable of doing so. He advocated that inspectors assist him to brush up his knowledge so that he can do a satisfactory job and get it inspected.

He advocated that state laws should call for civil service in order to keep the political angle out of the appointment of inspectors.

Ralph Grand, electrical inspector at Havre, Mont., described the work done to submit a bill for statewide inspection in Montana. However, the proposed legislation never reached the floor of the legislature.

To open the Saturday morning session, Lou Herman, Westinghouse Electric Corp., Great Falls, talked on the use of circuit breakers in panelboards. After discussing the history of fuses and circuit breakers, he described the development of new types which provide protection to the wiring as well as to the No. 18 lamp cord, and still provide a time delay for short overloads on motors, such as in refrigerators and washing machines. He compared the cost of a panelboard made up of old type safety switches with a small compact multibreaker unit and showed the distinct advantage of the latter.

Austin Dunham, district manager, Anaconda Wire & Cable Co., Denver, described the wire situation very frankly. The insulated wire situation is easing off and the allocation plan was removed March 1. There is a new trend toward consigned stock buying again, instead of outright purchase. Orders are more modest as the "heat is off." Contractors no longer order more than they can use in the hope of getting only a portion of their order.

The wire manufacturers, he said, have standardized on the most needed types and will not resume making the full variety until the current demand for standard sizes is met. The time is not far off, he said, when a contractor can go to the wholesaler and get whatever wire he wants.

However, this is not true of bare and weatherproof wire. This situation he called fantastic and he could see no relief from the allocation system. The terrific demand brought on by rural line extensions and tremendous increases in power company dis-

Some Montanans at the Great Falls meeting. Front row: James Simpson, Cascade Electric, Fort Peck; Paul Pistoria, Montana Power; Earl Hoff, Graybar; Roger Hofacker, Montana Power, Lewistown. Back row: Bob Ellerby, G-E. Supply: Leo Suddith, of same; Doug Donahue, Trumbull, Seattle; Bob Jones, Montana Power, Billings, and several others, part of the 90 total registrations this year

tribution needs has made these types of wire very scarce. The copper situation, he said, is no joke and the 1947 production will be from 10% to 15% short of the usual U. S. production. Another peculiarity of the times is that foreign copper prices lead those of domestic copper, which is the reverse of the usual situation. This is caused by the starvation for copper in Europe.

Lead is even more scarce than copper. He mentioned the two schools of thought as to the limit on the lead supply. There is no indication of additional ore bodies which can prolong the domestic supply of lead, however. He referred to the talk given by Rosch describing the competition for plastic materials and even for cotton.

Asked to talk on the work of Underwriters' Laboratories, H. G. Ufer, Western superintendent, Los Angeles, confined the description to Underwriters' testing of explosion-proof equipment. He described the various classifications of explosion hazards recognized by the code and differentiated between the types of equipment for these various locations. For example, equipment suitable for use in atmosphere containing acetylene gas is different from that required for gasoline fumes, and both are different from those used in dust atmosphere. Most gasoline pump installations, he said, were in flagrant violation of the code in that the outlet boxes were not sealed off to prevent passage of fumes into the conduit. He warned that vaporproof equipment will not do for explosive locations because it is not designed to stand the explosive stresses.

Ufer concluded by telling the difference between the label service of the Laboratories and the re-examination service, and asked that if any misuse of labels comes to the attention of inspectors that they report the facts to Underwriters' Laboratories.

The afternoon session began with the election of officers for the ensuing year. R. R. Grant, electrical inspector at Havre, was elected chairman. He has previously been chairman on one or two occasions. First vice-chairman will be Charles McDonald, electrical inspector, Anaconda; second vice-chairman, Carl R. Smith, state inspector for the Montana Railroad Commission, Helena. James Clune, Chinook Electric Co., was re-elected secretary-treasurer.

The talk by V. H. Tousley about the things already discovered as needing correction or clarification in the 1947 Code (see separate story) led naturally into a code discussion panel which was conducted by Homer Morton, Montana Electric Co., Great Falls.

A list of 20 questions obtained from interviews with contractors, wiremen and inspectors had been prepared in advance. Morton asked these questions of the experts present, such men as Tousley, Gaffney, Johnson, Dunham and others. The questions included some on aluminum wire and aluminum conduit, with particular reference to their use in atmospheres or under conditions which might cause corrosion of the metal. Another question was whether weatherproof wire was suitable for house wiring. A large number of farmhouses had been wired with it during the war. The answer was that the insulation is not flame-resistant nor moisture-resistant and is therefore potentially dangerous to use in house wiring.

Another question was in regard to the use of glass panels over lighting fixtures vs. explosion-proof fittings to light the interiors of spray rooms. Another question asked why manufacturers did not provide larger lugs for connection of wire on outlets and switches. Other questions included those regarding the distinction between old and new work when specifying wires in a conduit, flexible hookup for explosion proof motors, what can be done to prevent overfusing of No. 14 and No. 12 wire, bare neutral and whether a 35-amp. breaker is of sufficient size for a range installation.

After the code panel, W. L. Gaffney presented to the group the idea of rotating annual meetings of the Northwestern Section which he had presented to the Idaho and Utah Chapters. He asked consideration of the plan in order that it may be voted upon at the meeting in Eugene in September.

Carl Smith, former city inspector at Butte and now state inspector for the Montana Railroad Commission, Helena, made a strong plea for more intelligent action on the part of the whole industry to enact an electrical inspection law for the entire state of Montana. He said the need for such inspection was very great; only a few cities have ordinances and outside of their city limits wiring conditions are deplorable.

R. R. Grant proposed that a committee be set up to study other state codes and to prepare a draft of a code which could be offered to the next session of the legislature. He also suggested that members in each county contact their own representatives and sell them on the idea. Homer Morton was selected as chairman of this committee just before adjournment.

RMEL Engineers and Accountants

The Black Hills of South Dakota beckoned utility men April 11 and 12 when Engineering and Accounting sections of the Rocky Mountain Electrical League held their annual Spring Conference at the Alex Johnson Hotel in Rapid City.

A big-time buildup of the romantic and picturesque charms of the state in which the United Nations Organization was invited to settle (employing literature and art used for that purpose) drew one of the largest turnouts ever assembled for a between-convention RMEL meeting. Colorado, Wyoming, and New Mexico, in addition to South Dakota, were represented.

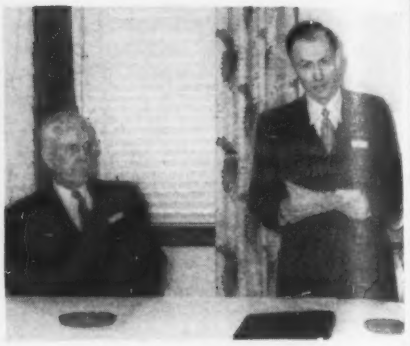
The two-day event was interspersed by sight-seeing trips, a banquet and a visit to the legendary Homestake Mine at Lead.

F. C. O'Kelly, General Electric Co., who is chairman of the RMEL Engineering Section, presided in his domain, and W. J. Benning, Southern Colorado Power Co., ramrodded the Accounting Division, after League President J. B. French, Black Hills Power and Light Co., called the two-dimentional meeting to order.

R. T. Barnum, Westinghouse Electric Corp., first speaker for the engineers, reviewed the colorful expansion of the Black Hills electric utility concern which was host to the conference gathering, followed by R. K. Foulk, Home Gas and Electric Co., Greeley, Colo., and W. S. Pullen Jr., General Electric Co., Denver, on *Control of Off Peak Water Heating*, detailing the time-clock technique now operating, in contrast with the system successfully used by eastern firms which superimposes high-frequency control over the local electric distributing system.

A highlight of the engineering session was J. M. Wissenbach's paper, *Mobile Communications for Utilities*. Radio engineer for Public Service Co. of Colorado, Wissenbach reviewed Federal Communications Commission's allocation of frequencies to public utilities and petroleum firms for direct communication between mobile units and a fixed station—17 channels in the 30-to-40 megacycle wave band and an equal number in the upper brackets. In the Rocky Mountain region, he said, Colorado Interstate Gas Co. operates 12 fixed stations along its hundreds of miles of pipeline, to service numerous two-way-communication mobile units. He pointed out that, although Public Service Co. of Colorado and Southern Colorado Power Co. have applied for permits, only one

At RMEL banquet: Mrs. Neil Simpson, J. B. French, RMEL president; Mrs. French; Harry Adler, Arvada Electric Co., Denver, and Mrs. Adler



W. J. Benning, RMEL Accounting Section chairman (left) and R. T. Barnum

electric utility in Colorado (the municipal plant at Lamar) has installed such equipment. To avail itself of FCC's program of allocating certain frequencies to stipulated areas in which companies may choose their own wave bands for sending and receiving, a committee to handle this assignment was set up, with Wissenbach as chairman.

Packaged Unit Substations on Utility Systems was discussed by J. E. Wilson, construction superintendent of Colorado Central Power Co., in the absence of his associate, Lee R. Jones, who was detained in Englewood, Colo., by an emergency situation. The address concerned itself with methods of continuing adequate and uninterrupted service during maintenance periods; use of portable substations, accommodation feeders, and air blast equipment.

Accountants heard M. A. Smith, Home Gas and Electric Co., list *Office Shortcuts* as an approach to efficiency and speed. He recommended, among other items, the elimination of the number of forms usually cluttering up bookkeeping procedure.

Harry Adler, Arvada Electric Co., wrestled with the problem of *Retirement of Undated Property* as one of an accountant's many headaches: what value to attach to worn and obsolescent equipment for writeoff and replacement purposes.

Cecil C. Johnson, Public Service Co. of Colorado, dilated the difficulties of determining what items qualify in industrial or commercial categories as an index to classification for excise taxes (or exemption).

E. E. Matthews, also from Public Service Co. of Colorado, had an informative text derived from his *Observations On a 4,500-Mile Accounting Inspection Trip*, relating the varied customer office methods employed in different portions of the nation.

Budgeting Under Present Conditions, presented by R. M. Miller, Southern Colorado Power Co., posed the quandary of accurate budgeting when deliveries may be two years in the future on a current order, and the cost double present list price.

A description, and technical summary, of the several hydroelectric plants to service the great Homestake Gold Mine, by Cedric L. Gust, chief electrical engineer at the property, was of extraordinary interest to engineers, accountants and the two-score ladies at the meeting. Annual convention will be held in Casper Wyo., Sept. 4-6.

There's an IES now in Utah

The six-sided box which has kept lighting cooped up and has limited its expansion, now has had all six sides kicked out, James M. Ketch, lighting engineer, Lamp Department, General Electric Co., Cleveland, told the joint meeting of a newly formed Utah Chapter of the Illuminating Engineering Society, the Intermountain Electrical Assn., and the Utah Chapter, International Association of Electrical Inspectors, April 7 in Salt Lake City. Ketch addressed the group on the subject, *Spring Lighting Review*, prior to making a formal presentation of a charter to the newly formed Utah chapter, IES, on behalf of President G. K. Hardacre.

The six-sided box, he said, consisted of the following:

1. *Light sources.* The limitations of filament light sources have been overcome with the advent of the fluorescent light, giving many times more lumens per watt.

2. *Color.* Before fluorescent lighting, color had to be screened through heavy filters at low efficiencies. But with fluorescent lamps, color is produced at high efficiency and brightness.

3. *Heat.* Both the heat of the filament and of radiation were present in the filament type lamps. The fluorescent sources are cooler.

4. *Lighting Patterns.* With former sources, spots, spheres or puddles of light were the only patterns available. With fluorescent sources, long shapes and patterns can be employed.

5. *Levels.* Fifty foot-candles was the limit with filament lamps due to the heat. Now levels of 100 or 200 foot-candles are possible without discomfort.

6. *Middle part of the Spectrum.* With previous sources, of course, only this part of the spectrum could be used, but now lighting equipment reaches into the infrared and the ultraviolet.

New horizons to be explored in the next ten years promise that the period will be a most interesting one in lighting history, said Ketch.

In school lighting the industry has a civic obligation which should be used to surmount the problem of money to pay for school lighting. No longer is it necessary to prove that learning comes faster under better lighting. The school people now ask how to get the lighting. The new school lighting code of IES has doubled the foot-candle intensities now recommended. Since 23% of the people in the country are either students, teachers or educators and with the tremendous number of GIs attending school, something of a national emergency exists in education. Lighting is a necessity to meet it, just as it was in meeting the war production emergency.

Office lighting needs not only adequate foot-candles but balanced brightness. Building owners are becoming conscious of competitive rentals and are thinking modernization. The main item in modernization in most buildings is lighting.

Some of the lessons taught by the war have been:

1. The use of continuous rows of lighting in factories.

2. High levels make the plant or office independent of daylight.

3. The perimeter of a room or factory needs to be lighted as well as the center area.

4. High-intensity lighting is needed for detection of flaws and for inspection.

5. Radiant drying proved a great boon in speeding many operations.

Ketch described a method of lighting soon to be used in the Metropolitan Museum of Art in New York City, which will do away completely with skylights and make the museum independent of daylight. He predicted that university libraries would provide enough illumination that no more local lighting would be needed on the tables.

In store lighting, Ketch detailed seven of 14 reasons for planned lighting as seen from the merchant's viewpoint. Briefly, they were: A well-planned lighting installation provides "stop and go" system, which directs store traffic to the places or merchandise that the proprietor desires; it puts every square foot of space to work; it lights the shelves and showcases as well as the center of the store; it enables customers to see color, texture and quality and brings the appearance value up to the price tag. He then described the 1-3-5-10 ratio of illumination levels required for merchandising, showcase and shelf and display niche areas.

The joint meeting was presided over by John Longden, president Intermountain Electrical Assn., manager Westinghouse Electric Supply Co., Salt Lake City. Mayor Earl J. Glade, who was to welcome the group, was out of the city. A preliminary talk, *Why Is Illumination Such a Dark Subject?*, by William A. Cyr, associate editor, ELECTRICAL WEST, San Francisco, kidded the highly technical language which engineering uses and urged new members of the Illuminating Engineering Society not to become frightened by such language. He advocated reading and understanding as much of the technical material provided by the IES as possible but, in contacts with customers, advocated translating the ideas into understandable terms.

At the conclusion of the meeting, Ketch presented a charter to the Utah Chapter. A. E. Fleming, General Electric Supply Corp., newly elected chairman of the chapter, received the charter and the gavel presented by the newest previously formed chapter, in this case that in Rochester, N. Y., in accordance with a custom in the IES. Ketch presented likewise to James C. Littlefield, secretary-treasurer of the chapter, a check for the chapter expenses as a pro rata of the membership dues. The attendance at this evening meeting was approximately 125.

PANORAMA OF THE PCEA

Edited by A. X. Schilling

Quick Tips on the Convention

Beginning with the opening session at 10:45 on Wednesday morning, June 4, and continuing right through to the banquet and entertainment the evening of June 6, it's going to be a great convention. Riverside, where PCEA was founded 30 years ago, will be host to what is expected to be a record attendance to participate in a well-planned, well-balanced convention.

To make way for delegates from the north who may not arrive in Riverside much before time for the opening session, southern delegates (and all others who can arrange it) are urged to register as soon as possible after the 8 a.m. opening. It is felt that this procedure will permit everyone to register and attend the opening meeting, a particularly interesting one.

Chartered buses will meet morning trains at Glendale on June 4 to take delegates directly to the Mission Inn at Riverside, convention headquarters. The opening session will be at the nearby Riverside theater.

The first session will be called at 10:45 a.m. to hear president Sanders' address, following which there will be a dramatization of the progess that the electrical industry has made since 1917.

The luncheon on June 4 at the Mission Inn will feature Harry Woodhead, president of Consolidated Vultee, whose topic will be *Human Relations in Business.*

Wednesday afternoon will be devoted to parallel section meetings, which are outlined on the program available at the registration desk.

Each section — Business Development, Operating Economics, and Administrative Services, is designing a program of pertinent subjects and prominent speakers for the occasion. These are the real working sessions of the convention, in which ideas and opinions from experts are heard and during which a free exchange of experiences, ideas, methods and criticism gives the convention its highest use value. Full details of these topics and names of speakers was not yet available due to the need to confirm arrangements and settle exact time for the speakers' appearances. Remember last year's convention was particularly strong in this respect.

Thursday morning's first session, at 9:15, will be held in the theater and will be devoted to a discussion on human understanding plus the interesting program arranged by the industry information committee. The luncheon meeting that day will be held at the Mission Inn, with Dr. Gilbert Brighouse, head of Occidental's psychology department, speaking on the subject *In the Depths of Defeat—Germany Today.*

Parallel section meetings will be held again on Thursday afternoon.

Friday's schedule will open with the business development section presenting F. T. Litchfield, vice-president of the Wells-Fargo Bank & Union Trust Co., who will discuss *The Industrial Growth of the West.* Then will come the Operating Economics Section's presentation of *Use of Atomic Energy for Generating Electricity.*

The association's annual meeting will be called at 11:15 a.m. on June 6, following which the delegates and their wives will be offered a choice of diversions for the afternoon. Late in the afternoon, a cocktail party will be held by the manufacturers, manufacturers' agents, wholesalers and distributors, followed by the association's banquet, entertainment and dancing, in the Memorial auditorium, near the Mission Inn.

Special events have been planned for the ladies during the hours that the formal sessions are in progress. Bridge, motion pictures, television programs and other events will be available.

Requests for hotel accommodations should be addressed directly to L. G. Peck, California Electric Light and Power Co., Riverside, who is the convention's hotel chairman and who will provide the best possible accommodations for delegates. Other committee chairmen are: H. H. Fogwell, program; Leon S. Heseman, stage; George C. Tenney, attendance; G. F. Maughmer, banquet; W. D. Howze, golf; W. S. Fleming, ladies' entertainment; Hance H. Cleland, reception; A. X. Schilling, publicity; Clifford Potts, registration; A. L. Laws, transportation; H. S. Warren, usher, and Earl S. Condon, cocktail party. General convention chairman is J. A. Long.

ELECTRICAL WEST

Graduate Sales Engineers

THAT era in which salesmen are wined and dined by customers is waning. With the same certainty as death, taxes and a newspaper's deadline, the day of highly competitive selling is coming, and coming faster than some people think. When that day arrives, selling will once again become one of management's most important functions. Once more industrial manufacturers will insist upon sales training and the ability to apply modern sales technique when they seek new salesmen.

Engineering graduates among the host of GIs should bear this in mind. So too should the younger men who just now are entering college. For a long time there was a distinct feeling of suspicion and dislike for anything that smacked of selling among engineering graduates. But time has demonstrated that the engineer with a little sales ability, coupled with a knowledge of production problems, economics and human relations, progresses much more rapidly than his fellows. Hence there is not so much hesitation about taking a sales position. In fact the title "sales engineer" carries with it both respectability and distinction.

Further recognition of this field as an attractive possibility for the young engineer has now been given by the University of California at Los Angeles. Its engineering curriculum includes a course in sales engineering. This is timely and appropriate. Other Western universities might well follow this lead.

By Democratic Means

IT is often forgotten in the rush of the times that the National Electrical Code is something of an achievement in industry self control. For the code is not arrived at by a governmental bureau or body, yet even the United States government voluntarily abides by it. It is a code that is developed and kept fluid and realistic by the very industry from which it springs and which in turn voluntarily conforms to it.

Fifty representatives of manufacturers, utilities, wholesalers, contractors, engineers, inspectors, labor, and state and city regulatory bodies write and rewrite the code from the changes that are suggested through a procedure that brings them forth from associations, inspectors, wiremen and others. It is in constant process of change and improvement.

The 1947 Code has hardly reached the hands of those who use it, yet the process of still further refining it and improving it goes on. The cities, counties and states that accept it as the basis for their legally enforceable codes do so because they respect the fairness of the self-disciplining process by which it is produced. The electrical industry can take real pride in this working demonstration of democratic process in regulation. Let there be more of it.

Come in and Be Taxed

FUNNY how the attitude toward a thing will change over night. Take industry, for example. What won't a city or community do to entice a new industry to come to the community in order that it may provide pay rolls, stimulate business activity, and give substance to the region! Some Western cities have even offered all kinds of free sites, trackage, market information and other inducements.

Then how many times the minute the company is set up and running, the political parasites seek to suck all its blood for taxes. It was a great guy before it moved in. It is a vile corporation that should be taxed into poverty once it is settled and a going concern.

Many electric power companies learned this change of public attitude. How eager the city and the people were to have electricity and to invite people with money to invest it in making the facilities possible. Then, once the company was going, how often have they turned upon it to seize its property or to milk it dry with taxes. Now the electric companies see the same thing happen to steel, to food processors, to oil, rubber and to other businesses.

Is the reward for initiative and gumption to be that of becoming the target for public greediness? Nowadays labor and government both act as if they created industry themselves. They want to draw their cut even before the owners and those who risked to start it are allowed even a weak voice in its affairs. How can business and industry continue to make jobs and products and increase the scale of living for all if they are not given some chance to pro-

EDITORIAL VIEWS

duce, free of such rapacious attacks. What this country needs is another freedom—freedom from parasites.

To Speed Deliveries

WITH apparatus and equipment manufacturers beset with material shortages and huge backlogs of unfilled orders, future deliveries have reached fantastic figures—in some instances as far ahead as 1950. Utility engineering and construction departments can help the manufacturers out of the tight dilemma in which they find themselves by cooperating on two points. One is reliance upon standard equipment instead of calling for special specifications. Standard equipment can be mass-produced in some cases; all special equipment requires special handling all the way through a manufacturing plant. Also standard equipment is less costly. The other place where cooperation would be helpful is in advising manufacturers of changes in construction schedules, particularly postponements and delays. In such instances delivery might be speeded up on some especially critical item. Until such a time as supply and demand are more nearly equal, such cooperation will be mutually advantageous.

How to Spread the Gospel

CONFRONTED with an acute political situation and a serious labor problem, a group of Western industrial organizations has embarked upon a radically different (for them) program of informing their people. For the first time and with results that exceed the fondest hopes of the proponents of the plan, top management is taking the men down the line—the sub executives and junior executives—fully and completely into its confidence. No aspects of the problems are too confidential and none of the strategy so secret but what all are fully informed.

Subjects which top executives felt were so sacred to them that they were discussed only in the intimacy of "the club" are now thoroughly worked over in councils where all executives are present. Result has been a new solidarity, a new and keen interest and, better still, some new ideas stemming from the juniors.

There are a few isolated organizations where such a policy has long been in effect due to the liberal nature of "the boss." In these days of transition and readjustment, the policy will pay dividends for all companies that apply it.

POLICIES and practices of government are directly related to the re-establishment of an orderly peacetime economy. Statesmen, industrial leaders and people generally are genuinely concerned today by the difficulty of balancing the federal budget and of reducing taxes from business to accomplish these purposes and government, therefore, should be in a position of encouraging the investment of new capital in profit-making enterprises. By the same token, government should refrain from investing tax dollars in fields of enterprise where private capital can supply investment needs, and, likewise, from entering into competition with its citizens by setting up unneeded agencies to supplant private business through use of public credit and tax exemptions. Government invasion of business can only defeat government's own program of tax extraction. One of the great deterrents to national peacetime progress is uncertainty of the government's financial program, and of its future policies toward American business and our established economic system. Clarification at this time of these two factors is a sorely needed act of leadership which would instill confidence and result in unity of purpose throughout the nation. To reach traditional American objectives will require full cooperation of agriculture and industry, labor and capital—all working together with a common understanding of mutual problems, and under the guidance of a constitutional government whose policies are sympathetic to the traditional American system of enterprise.—C. J. Strike, president, Idaho Power Company.

IT'S NOT SIZE THAT COUNTS

as Seattle dealer demonstrates

WHAT chance has the newcomer, the small store, to survive in the struggle for existence that faces electrical retailers in the months to come? Especially if that store is in a neighborhood of big stores, department and furniture stores with long-established clientele, with the major lines tied up on franchises of the better known makes, with charge accounts that invite adding the wanted new appliance to it rather than open a new account with a new little store? Talk to a dozen people and you get a dozen theories, mostly different.

Somehow, though, a talk to Harvey Abrams of Seattle and a visit to his little store at 214 Pine St., right in the midst of the department and furniture stores, leaves the impression that here is a young fellow who will see it through. He has been in business only a year and a half, it is true, but those months have been such as to test his enterprise. The way he is operating has the elements of good business in it.

From what he is doing others just starting in a small way and under similar competitive conditions can take example.

An electrical engineering graduate from the University of Washington, Abrams went to work for Seattle City Light after graduation. His experience was in the engineering and then later the sales department. He went to work at the beginning of war at the Boeing plant and remained there until the war's end. But during that time he and his wife were planning to go into business for themselves. They saved their money. They studied up on the appliance business.

In his spare time, because he is a good mechanic and likes to work in his home shop, young Abrams started to build the display cabinets and shelving he'd need in the store he hoped to open soon. He designed these cases and cabinets in sections, so that they would fit flexibly into whatever store he was able to rent, and also so that they could be rearranged to suit varying conditions of store display. This proved wise, because when he did open "Harvey's, Housewares, Appliances, Radio," major appliances were scarce and so he devoted the entire store to housewares that he was able to obtain. Now that major appliances are becoming available, he is shifting these display cases about in order to make room for the floor samples of the large appliances.

This pre-preparation for business paid off in many ways. It saved him a considerable cost in fabricating the display cases and shelving. Labor to make such things was very scarce then too, and he was not delayed in being able to start the moment the store he wanted became available. He was able to move right in and start selling.

When the pictures on this page were taken he was using his evenings to make a hood to go over his major appliance display, to set it off from the remainder of the small store. It too was to be portable so that the location of this display could be shifted if it was wise to feature it up front or to change the table appliances because of seasonal appeal.

The store is only 20 ft. wide by 50 ft. deep. It does have the advantage of being on the corner of an alley so that an alley window gets good visibility from the busy sidewalk in front. It is decorated in light colors and well lighted to give it attraction power as seen from the street in all weathers.

Like the store, the staff is small—himself, his wife and one man. Being a good mechanic, Abrams attends to the installation of appliances himself. He feels this is important in the sale of an automatic washer as well as a range or water heater. He can see that the customer gets the proper start in using it. His mechanical and electrical knowledge is useful too in selling. He is able to discuss the mechanical features of the radios and appliances in his sales presentation. He was making good use of it in talking to prospects when these pictures were taken.

The giftwares that were carried while merchandise was scarce will give way to appliances as they come in.

To summarize the elements which give this particular operation a sound footing and which if imitated will doubtless contribute to the success of any small store in a similar competitive situation, here they are:

1. Low fixed costs—his investment in fixtures and facilities was kept at a minimum because he was able to make much of the equipment himself.

2. Low overhead—because again he and his wife handle the business and do much of the work. There is a minimum of extra help and hence of accounting and costs of handling labor.

3. Efficient use of space—Though in a high rent district, the space rented is small and by flexibility of display every inch is made to work.

4. Good traffic location in a shopping district. This reduces the cost of bringing customers near.

5. Engineering knowledge put to good use both in selling and in installation and service. Study of the construction of the products is utilized in building up the sales story. This knowledge is particularly necessary in selling new makes not yet well known to the public. They require convincing proof of good design and quality manufacture.

Alley corner gives more window display space. Interior display cabinets all are interchangeable. Major appliance area

ELECTRICAL WEST Sales Guide

FOR THE ELECTRICAL MERCHANT OF THE WEST © MAY, 1947

Bulletin:

ELECTRIC WATER HEATERS NOW IN FAIRLY ADEQUATE SUPPLY EVERYWHERE. IT IS TIME TO SELL TO CREATE MORE DEMAND FOR MORE SALES AND PROFIT.

NO longer is the electric water heater the stepchild. Nearly everywhere now the ratio of sales to ranges is nearly one to one. This means real **public acceptance** as a result of all the hard work selling the idea in the past. Took real merit to win that acceptance. And the electric water heater really has it.

Now the supply is equal to the natural demand. So its high time to start creating some **plus** demand, again.

During the past couple of years sales have been a pushover. The customer came in, mind already made up, and pushed you hard in order to buy. No effort was needed on your part. What kind of satisfaction was that? Might as well catch carp.

Then welcome competitive selling again! Real zest comes when all the odds are not on your side. Electric water heater sales are **zestful.** You can really get **satisfaction** out of making them for that reason.

Even so they are not hard going like in the old high rate days. But there is still enough sales resistance to test your salesmanship and give you a thrill when you make a sale.

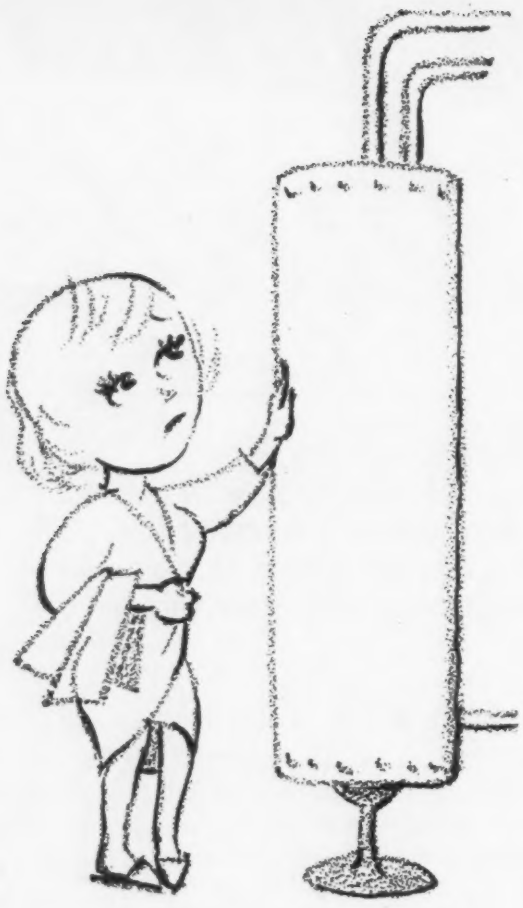
Cost of competitive fuel may look like a pretty big hurdle. Or maybe you've thought a water heater had no "sex appeal," no glamor, no umph.

But to offset these you have several **"exclusives"** with **electric** water heating that no other means of heating water can boast. These "exclusives" are that **electric water heating** is **SAFE, CLEAN** and **CAREFREE,** more so by far than competition.

Selling success and satisfaction hinge on you making these exclusives stack up high against other ways to heat water.

If you picture these virtues vividly enough you will create that **buying desire.** People to whom you picture these benefits will buy as soon as they can. Your effort will not be wasted. If **yours** is the most true-to-life picture of what plenty of good hot water, **SAFE, CLEAN** and **CAREFREE,** means to them, you are most likely to be the one who gets the order when the sale percolates.

See the next pages for a breakdown of this picture-making to your prospect.



"What do you do for Hot Water?"

One of the best water heater salesmen in the Northwest used that question to open conversation. He used it when he had closed a range sale, or even at the beginning of it. With that question he had made the highest percentage of water heater sales to ranges in the city.

Everyone heats water in some way. When they tell you how, it gives you an opportunity to compare the convenience, cleanliness, safety, healthfulness and long life of the electric to the old method used. The prime importance of hot water service to health and household cleanliness is told next.

In the close, offer to combine the heater and the range and bring both conveniences to the home at once.

Even to those already owning a range, the question, this chap found, gave him an opening to talk electric water heating. It gave him a clue as to their satisfaction or dissatisfaction with their old method.

It's an easy and natural question. It can be said offhand without "setting" the sales resistance.

Try it!

Then when you've made a break with it, follow with a sincere and honest suggestion of how electric hot water can make life easier for them.

Just tell them these advantages and "exclusives" of the electric way to heat water:

Carefree—Nothing to turn on or off but the faucet. Once installed you can forget it. Water always hot, yet won't overheat. Even if not used, water will remain hot for three days or more. Leave the house even with the children there alone and your mind can be at ease; there are no switches or valves for curious hands to touch.

Clean—Clean as electric light and sunshine. Cleanest fuel on earth—ashes, soot, odor, smoke all eliminated. Clean air means less cleaning of wall paper and paint, less housework. Heater itself as easy to keep clean as a plate.

Safe—Does away with open flames, possibility of leaky pipes or faulty flues. Approved by Underwriters' it's as good an investment as fire insurance. Water never gets dangerously hot.

Healthful—Cleanliness is next to godliness. Dependable hot water service makes bathing convenient, pleasant. Hot water sterilizes dishes, clothes. It is indispensable in time of sickkness. Hot water is a beauty aid too.

Always ready—Day or night it's ready. No waiting or tank patting. Requires no attention at all.

Cool in summer—Like a big thermos bottle, the heat is all sealed in. The tank is moisture-, vermin-, rot-proof, it keeps the heat at work inside. It's cool to the touch.

Before starting

1. **Type**—what kind of water heater the utility gives favorable rates to.
2. **Rates**—what the special water heater rates are and how applied.
3. **Water conditions**—whether hard or soft and what this requires in the way of a tank.
4. **Wiring**—whether any allowance or special arrangement is offered.
5. **Campaigns**—so that you may tie-in and ride in on the advertising.

While selling

1. **Size of family,** and ages.
2. **Bathing habits**—when and how often.
3. **Laundry**—is it done at home? Is an automatic washer used?
4. **Number of hot water** faucets.
5. **Location** of piping and where the heater or heaters will serve with least run of pipe.
6. **Insulated** hot water pipe, or can it be insulated to advantage?
7. **Which advantage** or special water heating service appeals most.

Quiet—No moving parts, no roar, cannot generate steam to pound the pipes.

Install anywhere—even in a closet, or corner without flue or air supply. Heating units give years of uninterrupted service and the thermostats are simple and positive as well as accurate. Monel or bronze tanks are guaranteed for 20 years or so.

Efficient and economical—with present low rates and the 100% utilization of heat. Gives all of its heat to the water, none goes up a flue. No waste in incomplete combustion. Remains efficient throughout its life. Abundant future fuel supply assured in electricity.

Improves property value—Home with most modern equipment has better resale value. Safest way to heat water reduces insurance risk. Longer life of equipment makes it a point of added value.

How Users Can Help

Here's an idea from a successful water heating salesman. If you have not used it, you'll find it mighty simple and effective:

"I learned my most helpful tool in water heater selling from my first call. I was calling on Mrs. T. and after having discussed the many advantages of a ready supply of hot water and of the electric heater in particular, Mrs. T. asked me whether or not there were any installations in town. I mentioned several and suggested that we call a few people on the phone and get some actual information from first hand users. Mrs. T. picked out a user from my list and I called her on the telephone.

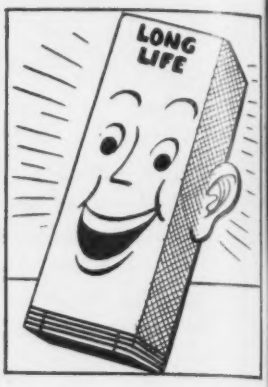
"After identifying myself, I asked her how she liked her heater, and her reply was so enthusiastic that I asked her to talk to Mrs. T., with whom she was well acquainted. She said she would be glad to.

"Mrs. T. took the phone and they talked for fifteen minutes. When she finally hung up, I had the contract ready and passed it to her without saying a word. She read it over and signed.

"I have used this method several times since and although they haven't all been quite as easy as Mrs. T. to close, have had very good results from it as a whole. I have found that the use of an electric water heater is the best sales argument I can use to close a sale."

Other good sales tools to use are the new water heating rates, photostats of users' bills, and to put some visual appeal into it, the visualizer books or cut-away display models of water heaters that are available from the manufacturer of the make you are selling.

Just some mighty good advice before starting to sell electric water heaters



IN taking on the sale of electric water heaters if you are smart you will drain the local utility of all the pertinent information that it has acquired by years of experience in selling this appliance. Not only can you avoid mistakes that the utility already has worked its way through, but you can take advantage of any angle of appeal that the utility has developed. You can select your merchandise with more accuracy if you know from utility experience that a certain style and size of tank will fit more of the average requirements of a community than other sizes. This means less inventory and better, faster turnover.

Campaigns launched by the utility are valuable market stimulating influences. A wise dealer will learn of these beforehand, prepare himself and his salesmen for them, and steer his course in the wake of such a campaign to reduce his own sales resistances. His own selling and advertising will be more effective in such campaign periods.

A salesman's commissions or salary depend on sales, and you depend on your income to get more than mere living—a chance at some of the luxuries and better things of life. The successful salesman of water heaters needs a little more preparation than for the selling of any other appliance, perhaps, but every bit of such preparation pays dividends. Preparation is more than 50% of any sale, anyway, a national survey recently found among the most productive salesmen. The pre-approach is 50% of the secret of a sale; the approach itself about 10%.

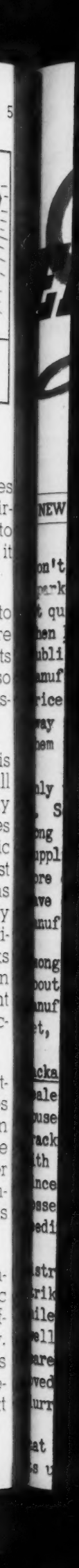
For water heater sales the pre-approach consists of getting advance knowledge first of local conditions such as rates, type of water heater for which the power company or utility in your locality has special low rates, water conditions, wiring allowances or arrangements that can be made for wiring, and similar information by which to select the right merchandise and sell it intelligently.

Second, it seems too obvious even to mention it, the salesman needs to prepare himself thoroughly on the product, learn its special and quality features, know it so completely that he can answer any question relative to it.

Third, the salesman who investigates his customer before even making a call will smooth his way and make more friendly contacts. He can better fit the advantages of an electric water heater to the specific needs of his prospect, which is the best way to sell. While many of the questions in the box on the preceding page may seem to be personal and perhaps impertinent, it depends on how the salesman asks them, how he explains that the information will assist him in determining just the right kind of water heater for the most satisfactory service to the prospect.

The manufacturers of electric water heaters now have convenient charts and tables by which you can convert the information thus obtained into an accurate estimate of the size of tank and capacity of water heater required. Nearly all utility companies have water heater manuals or sales and rate literature to help.

Get from the utility its slogan or its method of popularizing the low cost of electric water heater service. Naturally this is different in each power company territory. But if the utility has some such slogan as "10 cents a day for all the hot water requirements of the average home," use that too.



nces
r wir-
ch to
ell it

en to
epare
rn its
it so
ques-

es his
l will
endly
tages
ecific
best
stions
may
pertti-
n asks
nation
right
tisfac-

heat-
tables
nation
timate
water
com-
sales

meth-
lectric
is dif-
ritory.
an as
ter re-
se that

ELECTRICAL WEST Sales Guide

NEWS LETTER FOR THE ELECTRICAL MERCHANT OF THE WEST

Midmonth
May
1947

©

Price talk

on't look now but Price is here again. President Truman ork-plugged it and a lot of eager-beavers went to work on t quick-like. It had already happened in the radio field hen Emerson took the first dive to coax a sales-resistant ublic into buying table models in sufficient volume to make anufacturing costs scale down. Much as they'd like to see rices come down through, no dealer can afford to give way any of his present margins. There's not enough room in hem for any loss-leading.

Only ways

ly ways prices can come down in appliances would be if: . Some manufacturers decided to dump; 2. Or decided on a ong shot play for volume; 3. or firm prices from materials ppliers and stable labor conditions enabled them to produce re efficiently. The latter might be offset by the latest ve of wage increases, affecting both cost of materials and anufacture.

Fair Trade

ong the "sharp" merchandisers there has been some kick out having to hold to Fair Trade prices on brand lines. nufacturers who "Fair Trade" show no signs of cracking t, however. Proctor even reemphasized its policy.

Too big a package

ckage Mortgage bill in Colorado was killed in committee. alers opposed it on the grounds that it would be badly used in selling a whole houseful of appliances at one ack by builders, by-passing dealers. Selling appliances th the mortgage needs some clarification in any event. nce they would be part of the house, could they be re-ssessed for non-payment or traded-in when obsolete and eding replacement? Nobody knows the answer.

Squeezed

stributors were first to feel the squeeze from the buying rike. Orders and merchandise began backing up on them ile shipments of theirs still continued to come in, elling inventories. Fearing price drops, they were ared that they'd come before their inventories were ved out or while new was en route to them. There was a urry of cost analysing, credit scrutiny.

Snakes

at old "I-can-get-it-for-you-wholesale" evil began to rear s ugly head again. While merchandise was scarce the per-

suasive purchasing agent or the friend-of-a-friend turned their talents to getting much wanted appliances ahead of anybody else, even at full price. As stocks increased the plea for a discount returned. Retailers wondered if their suppliers would be able to hold the ethical line when the pressure for sales rose.

W. H. Robinson, Jr., advertising manager for General Electric Lamp Department, (formerly at Los Angeles division) told lamp dealer groups in a series of western meetings, that lamp pipe-lines are filling up except for 6-watt and 1-2-300's. Fluorescent lamps are 30% up over any previous year and still not enough to fill the demand. Photoflash lamps are 100% of prewar production but demand is 6 to 8 times. Major push will be made on infrared and sun lamps this year.

After initial introductions in the East, General Mills is now ready to start distribution of its Tru-Heat electric iron in the West, according to George A. Gillespie, San Francisco district manager. R. E. Imhoff, and W. A. MacDonough, home appliance executives of General Mills, staged distributor meetings at San Francisco, attended by G. E. Newlin, Los Angeles, and R. L. Zurcher, Portland, district managers. A new pressure sauce pan will be next, and a different type of automatic coffee maker later.

Market week, Aug. 4-9, in San Francisco, will be without any special dinners or events, because the opening of the new addition to Western Merchandise Mart, in San Francisco, will require the full attention of all. More exhibitors and expanded exhibits promise to make it a bigger market than ever.

Menasco Manufacturing Co. of Burbank, maker of the miniature washer, has become affiliated with the American Washer and Ironer Mfg. Assn.

Taylor-light Inc., of North Hackensack, N. J., is announcing a new line of new circular fluorescent-lamp-equipped ceiling fixtures called Circ-O-Lite, in a number of attractive designs. Taylor, formerly with G-E Lamp, heads this division of Appleman Art Glass Works.

D. N. Tatus & Co., a new appliance distributing firm in Helena, Mont., at 103 E 6th Ave., has been appointed distributor for Federal Telephone & Radio for Montana, northern Wyoming and part of Idaho.

Beautiful new show room and office of General Electric Appliances, Inc., the factory owned G-E line distributor for southern California, was opened at 150 W. Jefferson St., Los Angeles last month with appropriate ceremony.

Silex's saturation test in an eastern city is reported to have helped to keep sales at a high level, even after the apparent demand was filled. What it did show up, it is reported, was that dealers have gotten soft. They forget to reorder, even when they gripe over deliveries. Also they need to learn how to push the merchandise again.

Pioneer advances

epfreeze, pioneer in the home freezer field, sprang its w line to its limited franchised dealers of the West at series of meetings beginning at El Paso and Phoenix and ncluding Los Angeles, San Francisco, Portland, Seattle, illings and Salt Lake City, straddling April and May. n Sanderson, newly appointed regional manager, was accom-anied by F. R. Duggan, sales manager and "Andy" Anderson, rthwest district manager, and each distributor staff as-isted in the presentation. A home economist in each case old the food preparation story. The new line features ectangular freezers instead of the distinguishing double-rrelled models of the past. Its 10-ft. deluxe has auto-atic alarm, cold indicator, automatic adjustable tempera-ure control, dual lighting and a number of detail refine-nts and sells at $439.50. A simpler job with less gadgets lls at $379.50. A 4.8 cu.ft. deluxe model sells at 59.50, and one simple round 4-ft. model remains at 99.95. Not content with that, the line carries real lling ammunition, a food warranty plan, a 4-year replace-nt contract, a big national advertising and a flock of les helps.

No more standing

it-down ironing with the Proctor Never-Lift iron is a w surprise selling technique being introduced by means a nationwide promotion that began with a demonstration the Philadelphia housewares show. The company's new aster with a broiler in the lid, selling at $39.95 was so shown there. The sit-down ironing method is simplicity elf. A booklet explains and illustrates it. It offers e attributes of automatic ironer woman-saving to the one can only afford an iron. The idea is to bring the work the iron, let it do the work, eliminate extra handling.

Water systems now

bert Kramer, who has barnstormed for Westinghouse for y years, first in appliances, lately for adequate wiring, s left that company to become district sales manager for e jet pump division of Johnston Pump Co., makers of Aqua-tic water systems, York, Penn. The systems range in size m ½ hp. to 3 hp. Kramer headquarters at 2324 E 49th St., s Angeles, and will tour the West promoting water systems.

Change

George Miles, Jr., is another of the Miles boys, ex of stinghouse, to take on a new position. George Miles became stern division manager for Majestic Radio & Television

Strategy

National Retail Dry Goods Assn. convention discussed plans huge appliance drives by big stores to offset a decline the non-durable goods business.

Improves standard washer

has let the others spring the automatics, although has one up its sleeve waiting for a strategic entry. nwhile it has brought out a new spindry washer with an minum tub of the same gage as porcelain, a new gearcase h 98 less parts in its gear system. The tub is anodized harden the alloy and prevent discoloration. Sells for 9.95, only $10 over the standard spinner model. Fred ton, regional manager, says he is now sampling dealers will have increasing supplies.

Now operating to supply electric water heaters to the West is a new plant of the Clark water heater division of McGraw Electric Co., located at Azusa, Calif. Max McGraw himself came out to start it going, together with a group of other executives. Charles Mutter is plant manager at Azusa.

New p

Long awaited Certified Lamps will receive their first showings in June in advance of the summer shows. Deliveries will be made to retailers from coast to coast before fall, the Certified Lamp Makers promise, 100 in all. The new lamps differ in many ways from the past models.

Lamps soon

Bookings for the Construction Industries Home and Building Exposition of Southern California, June 12-22, at Pan Pacific Auditorium, will be 100% by now, and the appliance sections will be predominant in the show.

Big show

Estate Electric range is first with a Defrost-all feature for quick unfreezing of frozen foods. It proposed to get out a booklet to tell why proper thawing should be done, and how it differs with different products.

Defros

Nelson R. Thomas Agency has been appointed representative for all the 11 Western states for Drain-o-matic waste food eliminator, made by Rousselle Corp. and selling at $119.50. Also the Flo-master swing faucet with a new action and finger tip control, selling at $18.50.

New lines

U. S. Grant Supply Co., Los Angeles, has a new all-purpose refrigerator it calls the Modern, a 22 cu.ft. job with large frozen food compartment, ice maker, and ample storage space. Appeal is to the farm trade and large urban families. Grant has also added a dealer service division to aid with advertising and sales training, bank credit, displays.

Big reefer

Sunset Electric at Portland returned to one of the best techniques for training men to sell electric ranges. It held a cooking school to teach its dealers' salesmen how to cook on a Frigidaire range.

Can cook

Look out for a slicker representing himself as getting memberships for an electric appliance dealers association with headquarters in Sioux Falls, offering a prospect file system for a substantial down payment. There is no such association and you'll never get the prospect file.

Fake

General Floorcraft Inc., of New York, began advertising its General T-12 electric home floor conditioner, at $69.50. Among the list are three California dailies.

Floors

Encouraging news from Henry Rice, So. Cal. Edison's residential manager. His big crew of adequate wiring promoters now find tract builders, who wouldn't listen to the need for adequate wiring a year ago, coming around and asking for it now, to give them something extra to sell their houses. Meter sets in March, Rice reported, domestic alone, were 5,807, or 13,958 since Jan. 1. These are new homes. The year's quota of 48,600 is being met right on the nose.

Want advice now

New pl

Lamps
soon

Big
show

Defros

New
lines

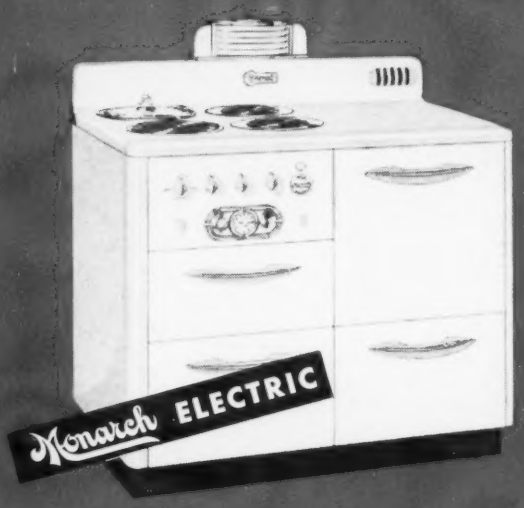
Big
reefer

Can
cook

Fake

Floors

Want
advice
now



Model F56P. Has 16" oversize oven, three Kloz-Koil or Dura-Glaz surface units, 6-qt. "Side-Heet" cooker, three utensil storage drawers. Smokeless, porcelain broiler pan. Signal light for surface units — illuminated oven dial — appliance receptacle — and combination timer-notifier clock. Cooking top is 38½" x 22", 36" high.

Model LN6J6. Has 16" oversize oven with dependable automatic control. Drop-front, drawer type, broiler. "Hi-lo-reflex" burners with 2-position gas cocks and automatic lighter. Two utensil storage drawers. Modern light and notifier. Porcelain enamel exterior finish with chrome and white plastic trim. Cooking top is 38½" x 22½", 36" high.

TWINS

WITH these Monarch-built, twin-designed ranges on your floor, you can offer the woman who prefers *gas* or the woman who prefers *electricity* . . . . the same top-flight quality in modern range design. All the weight and strength of Monarch's half-century of range-building experience can be thrown behind the sales effort of your *entire* range line, both gas and electric — to give every range customer the very last word in up-to-the-minute cooking conveniences.

MALLEABLE IRON RANGE COMPANY
3957 Lake Street Beaver Dam, Wisconsin

RANGES AND HEATERS
Monarch - Paramount
COAL - WOOD, ELECTRIC, GAS and COMBINATION RANGES

In Pueblo—Electrical Dealers Set the Pace

Making the most of available merchandise a year ago, Kyle Electric had an attractive display. Now it is opening an uptown selling station, a new idea

PUEBLO, Colorado, has modern-minded electrical dealers. In fact their stores are far out in front of the other stores in town in appearance and sparkle. Modern streamlined fronts and interiors, and even an uptown "selling station" for one of the pioneer dealers, give the city distinction as an up-to-the-minute place. It long has had a special reputation as a musically minded city due to the community music activities carried on by one live-wire dealer.

Phillips Music Co. is the one that has put music into the young blood of Pueblo. It has organized and taught several bands of local youngsters. There's the Crusader band of youngsters. The Concert band now is made up pretty much of veterans who once played in the boy's band. Then there is a Spanish band, and several accordion band groups. They rehearse in the large rear upstairs rooms of the Phillips store on Main Street and Fred R. Voss, owner, says proudly that they'll always be a vital part of the business.

Music and records occupy the front of the Phillips store, and the appliance department, managed by R. E. Wagner, is at the rear, with a radio room under a balcony band instrument shop. As appliances become available, there will be a complete Westinghouse kitchen and a Youngstown kitchen. Both Bendix and Laundromat are to be featured. The radio lines include a wide variety.

Down Main Street four blocks away, among the department and chain stores, Stillman Music & Appliance Co. opened last August. It is affiliated with Phillips but run separately by Zinn Stillman, formerly in the financing business. This store features General Electric appliances and kitchens, Bendix and Gibson and several lines of radio and records. A large music room at the rear offers a place to display and demonstrate many makes and models of radios, combinations and pianos. The store front is ultra-modern, with a full plate glass from ceiling to sidewalk, slanted inward. It has done a consistently steady business month after month since it opened, with the merchandise available.

Vidmar-Mathis Appliances & Music was first to open with a modern front that took the eye of all townspeople. For many years these partners, Jake T. Vidmar Jr. and Lou Mathis, had operated a tiny store at the corner of Main and an alley. When the present store became available, it was completely remodeled and given the ultra-modern front shown in the picture on page 118. Plate glass from ceiling to sidewalk gives it an inviting open appearance that is almost as if there were no glass or barrier at all between the passer-by on the street and the attractive display of appliances and radios inside. Since the accompanying picture was taken, solid glass doors have been installed and a new silhouette sign erected on the marquee.

To further the effect both the sidewalk of the slanted front under the marquee and the window display area just back of the glass have the same tile flooring and the marquee extends inside the glass over this area. Built-in fluorescent lighting units with prismatic glass covers light this area. Inside, a different type of fluorescent fixture is suspended from the higher ceiling. The radio and record departments are under the curved and light veneer wood finished balcony where the office is located. A Hotpoint kitchen is to go in a space especially provided for it at the left side.

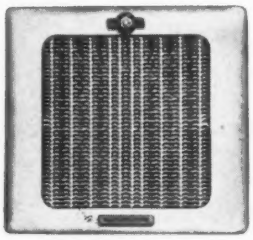
Lou Mathis intends to go to town with dishwashers as soon as he can get some. He enthuses over dishwashers in a way that promises well for future sales. He feels that the pioneering is over and that the dishwasher can be sold alone or in combination with kitchens. In fact, while he handles Bendix and will have Hotpoint's automatic washers, Mathis feels the dishwasher can have just as fast a market as these automatics. The dishwasher is also automatic now, he says, and does a good job.

Because water in Pueblo vicinity is hard, he also feels that there is a fine market for water softeners to accompany any dishwasher or clothes washer sale. With refrigerator margins down, he thinks that it will be necessary to keep selling costs on them down too, but the dishwasher and water softener can make a dealer some money.

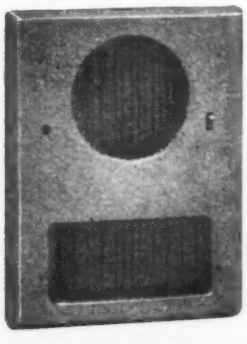
R. B. Kyle Electric Co. is the one that is establishing a "selling station" uptown, an interesting experiment. Kyle's has been at its 224 N. Union St. location since 1903. When it was established, that was the center of the town's business district. Now business has moved further up town to Main Street. The main place of business is

Model PJ-13 Portable Room Heater. 110 volts A.C.; 1320 watts; 4507 BTU. 13" high, 11½" wide, 7" deep.

Only ELECTROMODE HAS THE SAFETY-GRID!



Model WJ-13 Bilt-in-Wall Small-Room Heater. 110 volts A.C.; 1320 watts; 4507 BTU. Approximate wall opening required: 9⅜"x11⅜".



Model W-12 Bilt-in-Wall Room Heater. 230 volts A.C.; 1500 to 3000 watts; 5122 to 10245 BTU. Approximate wall opening required: 14¼"x18¼".

THIS newest idea in home heating is a real money-maker for many a contractor, wholesaler and dealer! Here is something no other heater can offer—all-electric operation *plus* absolute safety thanks to Electromode's exclusive Safety-Grid Heating Element (see X-ray View above). It has no exposed hot or glowing wires, no danger of fire, shock or burn.

Electromode All-Electric Room Heaters are demonstrating daily, the many profit possibilities of handling a quality product built to give service-free operation throughout long periods of use. Sell Electromode and you sell complete heating satisfaction.

ELECTROMODE CORPORATION • 45 Crouch Street • Rochester 3, N. Y.

For Booklet 46-D illustrating and describing Electromode Room Heaters, write Department EW-57.

ELECTROMODE Room Heaters

ELECTROMODE REPRESENTATIVES:

FRED W. CARLSON
307 Wall St.
Seattle 1, Wash.

HARRY F. HALDEMAN, INC.
1106 S. Hope St.
Los Angeles 15, Calif.

RUSSELL & COMPANY
1355 Market St.
San Francisco 3, Calif.

WORLD'S LEADING EXCLUSIVE MANUFACTURER OF ALL-ELECTRIC HEATERS

still excellent for the contracting and industrial and farm equipment business that has been built up over the years. It has been good even for merchandise selling and will continue to be. But Bob Kyle Jr. has taken a store right among the department and chain stores, at 214 N. Main, and it will be opened shortly. It too has a modern front and interior.

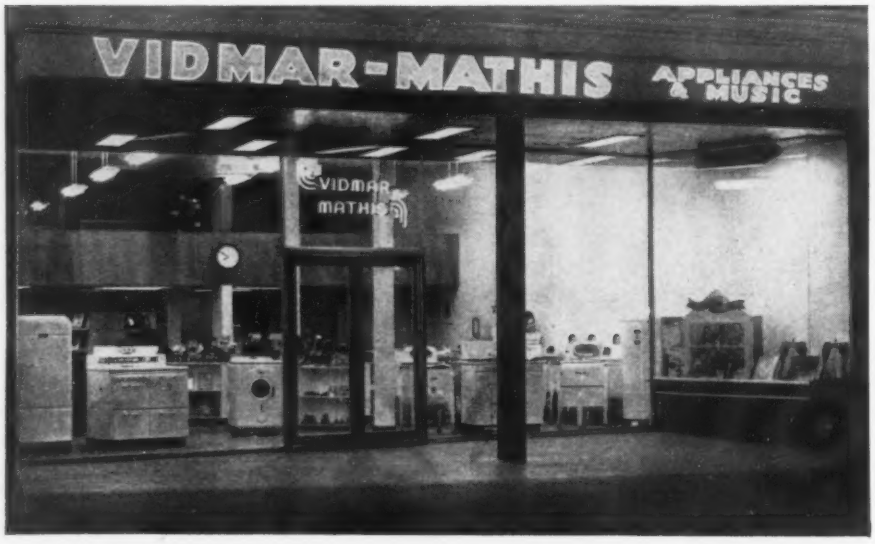
This will be strictly a "selling center" for Kyle's line of Frigidaire and General Motors appliances. It will have no duplicates on the floor, the floor sample being the selling piece. Deliveries will be made from the main store. It will be manned by the appliance salesmen. Its phones will be interconnected with the main store. There is only a small "closing room" or office in it. An attractive balcony will contain apartment-house models.

Main store will continue the steady service business, wiring, motor overhaul and repair and warehousing for the entire operation. It has always been well lighted at night so that people driving by it were given a good advertisement of electricity and electrical wares. Pioneer R. B. Kyle himself, who started wiring bell and annunciator systems and arc light systems in 1903, is always pleasant, smilin and cordial.

Another music store which is resuming appliance promotion is Martin Music Co., handling Kelvinator, Presteline and Electromaster. A large music and record stock is also carried. Remodeling was going on to provide more attractive appliance display rooms.

Even Southern Colorado Power Co. modernized the front entrance of its building a year ago with inset, slanted glass to the sidewalk, and built-in lens plate lighting units over its entrance area. It has again installed a model kitchen in the window area. The kitchen it once had there years ago was sold to a needy customer during the war and only now has been replaced.

While the company does some merchandising, it puts no emphasis on appliances already having full acceptance, such as refrigerators and washers. It pushes ranges and water heaters because of the severe gas and LP gas competition, according to Dick Pemberton, sales supervisor, and G. W. Milliken, vice-president of sales. The company strives to cooperate with dealers in every way possible and enjoys friendly relations with all dealers in the area. A branch of the Rocky Mountain Electrical League is being revived as the medium through which to promote an over-all selling drive for things electrical.



First modern all-glass front in town was that of Vidmar-Mathis. It set the pattern for several others since then. The entire store becomes an attractive show window

In Stride Again

The Inland Empire Electrical Dealers' Assn. has appointed Robert L. Wilkinson of Spokane to be its executive secretary and is opening offices in the Washington Water Power Building in Spokane.

This Spokane office will serve as headquarters for chapters in Davenport, serving the central Washington area; Coeur d'Alene for north Idaho; Lewiston, central Idaho; Pullman, the Palouse region of Washington.

The organization will work with dealers in maintaining high standards of merchandising, encouraging fair trade practices and in promoting public interest in the use of radio and electrical appliances. A program which is being outlined by Wilkinson will include sales training, equipment exhibitions, cooking schools and sales promotion, according to John F. Boothe of the Brown-Johnston Co. and president of the Spokane chapter.

Other officers of the Spokane chapter are Richard Nelson, the Palace, vice-president; F. A. Tool, secretary, Washington Water Power; Kenneth Hughes, Hughes Electric, treasurer; and directors, Lester Barnes, Maxwells; V. J. Morris, V. J. Morris Company; E. S. Bergquist, Washington Electric Appliance Co., and Stanley Densow, Densow's.

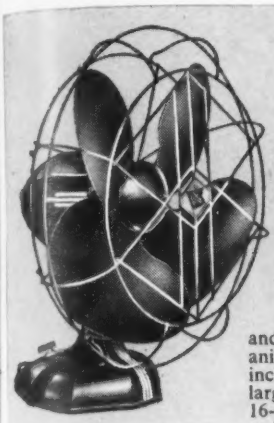
First Campaign

Enough water heaters are now available to permit the running of a real sales campaign. So for the first time since it went out of merchandising and for the first time since the war the Southern California Edison Co. and electric distributors and dealers in its territory will put on a strong selling campaign. Quota for the campaign, to be sold entirely by dealers, is 3,750 water heaters, said H. C. Rice, manager of domestic sales.

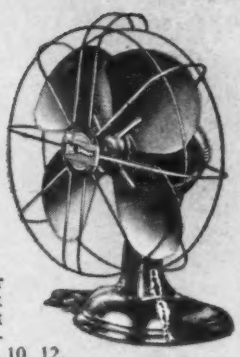
On April 15 a preliminary meeting of appliance distributors assured the cooperation of all concerned and promised an adequate supply of water heaters to sell. On April 21 a meeting to train the volunteer crew of distributors' men was held. In this the six four-man teams, each with one Edison man and three distributor men, were briefed for the 28 meetings with dealers throughout the area served by Edison. These meetings begin May 5 and run every other night in six places simultaneously until the entire territory is covered.

Each team tells a previously prepared sales story which dealers can use in merchandising water heaters. Then each is supplied with a comprehensive manual prepared by Edison Co. last September awaiting the return of enough merchandise to warrant a campaign. Advertising support of 1,360 ads in 170 newspapers, plus 400,000 direct-mail pieces is to be given the campaign and one of each make of heater will be displayed in Edison offices with cards directing customers to see their dealers.

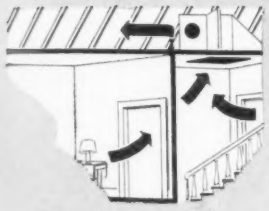
As to the market, Rice estimates that there are approximately 40,000 replacements of water heaters in Edison territory a year. This is 3,333 a month, or 167 a day. In addition some 200 new houses are being connected per day, each of which should be a prospect for water heater, making a 367 total a day for the system. These figures will be broken down by districts to show what the prospects for sales are in each locality.

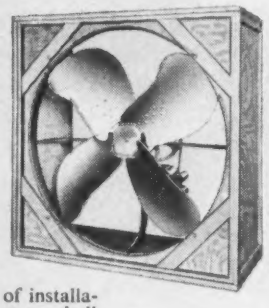


DE LUXE FAN Body, base, and blades in lustrous pearl-essence finish with contrasting silver striping and bright guard. Modern, durable die-cast motor body and base. Totally enclosed oscillating mechanism. Wide, overlapping 10, 12, and 16-inch blades give unusually quiet delivery of large air volume. Three speeds on 12 and 16-inch fans. Price includes bracket for wall mounting. Guaranteed five full years.

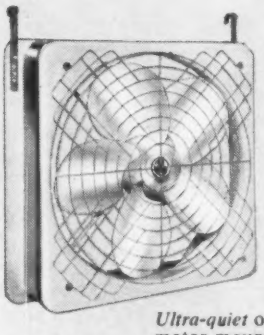


BANNER FAN Popular priced. Gives big air delivery at low current cost. Lustrous dark brown finish. Streamlined, sturdy die-cast motor body and base. Totally enclosed oscillating mechanism. Wide, quiet-running 10, 12, and 16-inch blades. Two speeds on 12 and 16-inch fans. Wall-mounting bracket included. One full year guarantee.





ATTIC FAN Cools the *whole* house for years—for less than the cost of a week's vacation. Available in 30, 36, 42, and 48-inch sizes to suit any type of installation. Fan operates in any position because ball bearings are used throughout. Quiet-running—motor mounted on live rubber; blades driven at slower speeds. Four wide, scientifically designed blades within true Venturi Ring that eliminates excessive "air whip" and inefficient re-circulation.



HOME COOLER It's *portable*—customers set it into open window; take it along when they move! *Ultra-quiet* operation—no belts . . . no pulleys . . . motor mounted in live rubber. Rich ivory finish. A space-saver—extends only 6½ inches into room! In 24 or 30-inch sizes to fit most windows; in 24-inch size mounted on adjustable stand. Three speeds on all models. One full year guarantee.

PEDESTAL FAN Pearl-essence finish on blades, motor housing and base. Brightly finished guard. Adjustable for height—12 and 16-inch models from 38 up to 62 inches; 10-inch fan from 35 to 59 inches from floor to center of guard. Wide, quiet-running, overlapping 10, 12, and 16-inch blades. Totally enclosed oscillating mechanism. Two speeds on 12 and 16-inch fans. Guaranteed five full years.

Here They Are!

R & M NATIONALLY ADVERTISED FANS!

As complete an assortment as you could ask for. Styles to suit every taste. Prices to fit all purses.

And they're *good* fans—backed with 50 years of fan-making skill. They're business-builders for you, too. They give your customers the one thing that brings them back—satisfaction. For you are authorized to repair or replace any R&M Fan found to be defective during the life of the guarantee.

National advertising helps you merchandise them. Point-of-sale material, newspaper mats, and other sales stimulants (all at no cost to you) help you sell them. So, see your nearest R&M Fan distributor OR mail the coupon for his name, address, and literature on this fast-selling R&M Fan line.

ROBBINS & MYERS, INC. SPRINGFIELD, OHIO · BRANTFORD, ONT.

MAIL THIS COUPON *today!*

ROBBINS & MYERS, INC.
Fan Sales Division, Dept. H, Springfield, Ohio

Please tell me who my nearest R&M Fan distributor is and send me new sales-promotion literature on the R&M Fans checked (√).

☐ Home Coolers ☐ Attic Fans ☐ Pedestal Fans
☐ Banner Fans ☐ De Luxe Fans

Name.....

Firm Name.....

Address.....

City.....*Zone*.....*State*.....

Freezer Drive

So. Calif. Assn. briefs dealers

Home freezer selling in the Los Angeles area will receive a strong shot in the arm when the Southern California Radio & Electrical Appliance Assn. holds a special "all-out" meeting of everyone connected with the business, at the convention hall, Embassy Auditorium Bldg., 839 S. Grand, May 23 at 8 p.m. Bill Quinn, association manager, has lined up a program designed to acquaint dealers and distributors with the things that will help sell home freezers. The supply is now in sufficient quantity to assure delivery, but hardly anyone ever had to sell them before.

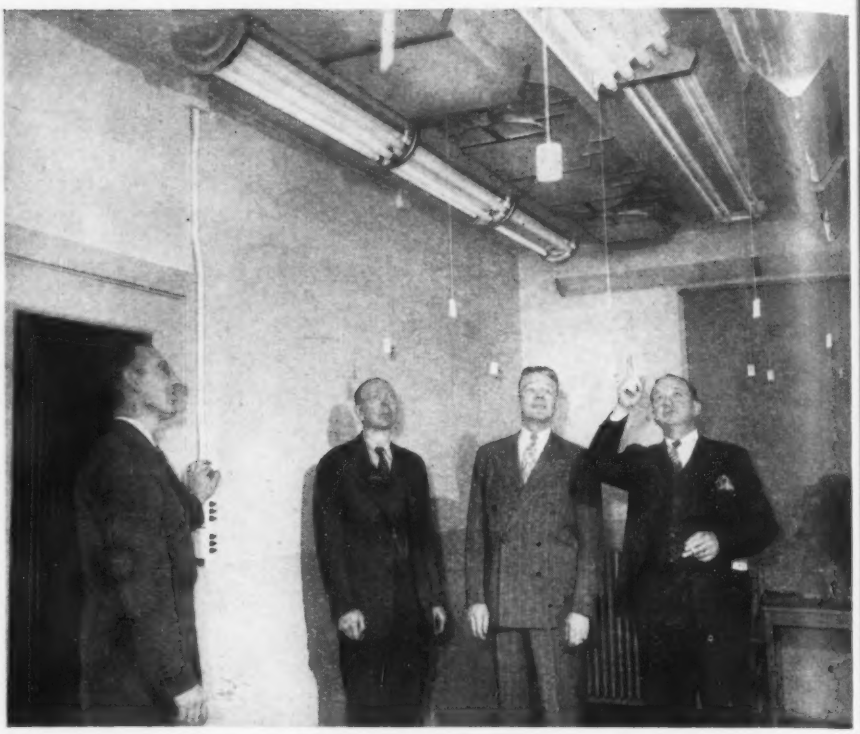
The technicolor picture, *Frozen Freshness*, of Frigidaire, will be shown. It is strictly an educational picture applicable to all makes of freezers. T. J. McIntyre, Pacific Coast manager, Yorkville Paper Co. and an authority on using and preparing foods for home freezing, will be the featured speaker. He will give his own 20 years of experience with a home freezer. An open forum for questions will conclude the meeting.

Barnstorming

Farm electrification will barnstorm with a tent show throughout the territory served by Utah Power & Light Co. this summer. Following the cattle shows, county fairs, agricultural events, the utility company's 50x60 tent, manned by Rex Ward, will be pitched and the farm electrical equipment loaned by manufacturers and dealers for the season's showing will be demonstrated to the crowds in attendance.

The tent, which started barnstorming at the Southeastern Utah livestock show at Ferron, Utah, April 25-26 and will continue to play until the big live stock show in Ogden in November, is divided into six booths. Each booth features a particular phase of farm electrical usage. One shows poultry, another dairy, a third stock farming electrical equipment. One has a G-E model electric kitchen. One tells the adequate wiring story. One has a miniature farm to show distributions and farm outdoor lighting.

Utah Power & Light furnishes the tent and mans it, makes the arrangements. Equipment is loaned by manufacturers and dealers. There is but one of any particular item. Some, too large to include, are represented by photographic enlargements. Live interest will be given in some cases by stocking the pig brooder with live suckling pigs which will be given as prizes at the conclusion of the showing. The activity is under the supervision of J. F. McAllister, manager of residential and farm activities.



Where contractors can bring their customers to see in actual operation a variety of fluorescent fixtures, Illumescent Products Inc. of San Francisco, offers something unique in wholesale service. Moody M. Jensen, general manager, at left, is shown switching on some "All-Brite" units, made by Fluorescent Fixtures of California, for W. H. Busch, Busch Mfg Co., and Arthur Mills, Office Appliance Co., customers of Grant Whitaker, Manning & Whitaker, electrical contractor, right. Separate show rooms are provided for each make carried such as Watco Engineering Co., Mitchell, Frink Corp., Fluorescent Fixtures of California, Pacific Full-o-Lite Corp. Each room has a number of samples wired and individually switched. Tags from each give the retail list price only and pertinent wattage and other data. Literature on each is in the room. Thus the contractor can use the room as if it were his own showroom. Ample stock of fixtures and lamps give quick service to the contractors' customers. This unique showroom is at 926 Natoma St.

Canadian Questions

Whether dealers or utilities should sell appliances, modern trends in street lighting, transformer design trends, psychological methods in personnel matters and a decline of public interest in public ownership, highlighted the three-day Western spring convention of the Canadian Electrical Assn., at Vancouver, recently, attended by the largest group on record at a Western meeting. T. Ingledow, vice-president and chief engineer, B. C. Electric Railway Co., Vancouver, was chairman of the convention committee, and other western Canadian electrical men were prominent in the program. The engineering section and utilization and sales section ran their programs simultaneously, S. L. Lawton, assistant chief engineer, Aluminum Co. of Canada, Ltd., presiding over engineering sessions, Howard Walters, general sales manager, B. C. Electric Railway Co., over the utilization and sales section, and O. A. Peterson, personnel manager of the same company, the personnel sessions.

Whether dealers or the utilities should merchandise was thoroughly explored in the Wednesday session when various speakers talked on several aspects of the problem. Even the manufacturers and wholesalers presented their point of view on the situation, and G. Langtry Bell, chairman of the dealers organization, defended the dealers' responsibility in the matter.

TO KEEP ELECTRICAL APPARATUS OPERATING AT ALL TIMES

GENERAL ELECTRIC SUPPLY CORPORATION
has a complete stock of
RENEWAL PARTS
for
FRACTIONAL HORSEPOWER MOTORS

CONTROLS • SWITCHGEAR • FLOODLIGHTS
SOLDERING IRONS • GLUE POTS
INDUSTRIAL HEATING THERMOSTATS
STREET-LIGHTING EQUIPMENT
DISTRIBUTION TRANSFORMERS

Standard RENEWAL PARTS Kits
for Magnetic Starters

G-E MAGNET WIRE
G-E INSULATING MATERIALS
G-E TESTING INSTRUMENTS

Write for Renewal Parts Catalog

All eleven Offices and Warehouses of the
GENERAL ELECTRIC SUPPLY CORPORATION
on the Pacific Coast can deliver from
present stocks.

GENERAL ELECTRIC SUPPLY CORPORATION

SAN FRANCISCO • OAKLAND • SACRAMENTO • FRESNO • LOS ANGELES
SAN DIEGO • PHOENIX • SEATTLE • PORTLAND • TACOMA • SPOKANE

Score a home run... **a home run in terms of increased revenues . . . a home run in terms of consumer satisfaction . . . because the WESIX Wiredheat Systems not only satisfy the ever growing demand for 100% electrically heated homes but provide increased revenues as well.**

Good diversity. Since each room to be heated requires a separate heating unit, thereby eliminating unnecessary over-all heating, demands are not co-incident . . . and with thermostatic control good diversity is assured.

Thermostatically controlled automatic heaters prevent waste of current due to overheating . . . provide uniform or steady loads with maximum consumer comfort.

The fully insulated house requires less connected load . . . leading to a saving in transformer and service capacity . . . producing a flat load characteristic.

Correctly sized heaters provide sufficient capacity without excess to keep demands at a minimum. *(And the WESIX installation is correctly sized because of accurate engineering service.)*

Planned distribution systems can meet the exact locational demand of the load. By utilizing the National Electrical Code all-electric homes can be controlled.

FOLLOW THRU

BUILD REVENUE

WESIX ELECTRIC HEATER CO.
390 First Street, San Francisco, California

SCORE WITH WESIX

WIN WITH A PROFITABLE LOAD

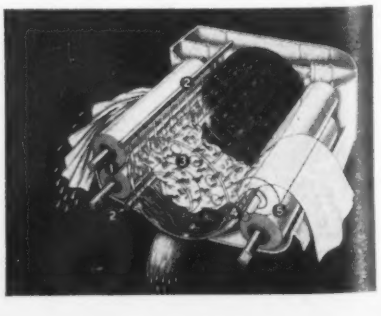
APPLIANCE PREVIEW

Water Heater (537)

The 1947 Hotpoint automatic electric water heater has pressurized direct-control Calrod units, installed under a holding band and held in place against the tank with 200 lb. tension spring. The galvanized steel tank is surrounded on all surfaces by a one-piece blanket of glass fiber insulation. A magnesium tube (optional) extends the full length of the tank, with built-in heat trap at the heater top to prevent hot water from circulating through the house system when not in use. These heaters come in two tank diameters, with a 16-in. in the 15-, 30-, and 40-gal. sizes and a 20-in. in larger sizes. Heaters are available also with Monel tanks.

Washer (538)

A "scum-free" rinser with automatic operation is a feature of the new ABC-O-Matic washer manufactured by Altorfer Bros. This rinser is claimed to float away loosened dirt and particles of soap fat in a bath and shower of running water. In the rinsing operation, clothes travel through rolls which remove and return soapy water to washer compartment; pass through top and bottom sprays of fresh water; are carried by a floating flexor cylinder into the final rinsing stage, where they are gently flexed while submerged in constantly changing water, skimmed free of scum or soap curds by a flushing overflow. Following the rinsing cycle, clothes pass through damp-drying rolls into the laundry basket. A full load of clothes is automatically rinsed in less than three minutes, the manufacturer states.



TROUBLE-FREE FLUORESCENT FOR HOME LIGHTING...

thanks to Certified Ballasts!

PORTABLE lamp makers are becoming increasingly aware of the importance of proper auxiliary equipment to get best results from the circular fluorescent tube. For on this auxiliary equipment—the BALLAST—depends the success of fluorescent portable lighting in the home.

Be sure, therefore, that the lamps you make or sell are equipped with CERTIFIED BALLASTS—*for the protection of your customers . . . and yourself.*

CERTIFIED BALLASTS, installed properly, prevent excessive heat—thus avoiding the risk of injury to table tops and floor coverings. CERTIFIED BALLASTS are free from distracting noise. They make satisfied customers.

WHAT DO WE MEAN BY "CERTIFIED"?

"CERTIFIED" on a ballast means that it has been built to exacting specifications set up by leading engineers—for use in a portable lamp. "CERTIFIED" means that nationally famous Electrical Testing Laboratories, Inc., continually tests and checks the product against these specifications... give it the stamp of approval. And CERTIFIED BALLASTS have long been the accepted standard in commercial and industrial fluorescent lighting. They're your best assurance of dependable performance . . . and customer good will.

•

Certified Lamp Makers have solved their ballast problems by writing CERTIFIED BALLASTS into their specifications.

CERTIFIED
ETL
SPEC. NO. 6
HIGH PF

CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting Fixtures

Acme Electric Corporation
Cuba, New York

Chicago Transformer Div.
Essex Wire Corporation
3501 Addison St., Chicago, Illinois

General Electric Co.
Specialty Transformer Division
Fort Wayne, Ind.

Jefferson Electric Co.
Bellwood, Illinois

Sola Electric Co.
2525 Clybourn Avenue
Chicago 14, Illinois

Starring and Company
Bridgeport, Conn.

Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn.

with

Paragon

Timers for attic and window fans

Thousands of homes have attic and window fans . . . still others will have them.

You can make extra profits by helping these homes "Beat the Heat," with Paragon AF Timers to control the fans. Provides extra comfort and convenience. Preset, these timers control the fans automatically, for any period, up to 20 hours.

Work with all A.C. fans . . . Telechron motored (QUIET), handsomely finished drawn aluminum case . . . dial and pointer protected with clear Plastacele.

Timer motor runs only when timer is operating the fan. Setting may be changed at any time without harming the timer. Dial graduations plainly marked for easy setting. Lists at only $9.75 . . . worth that in one season . . . good for many many years.

$9.75 list price

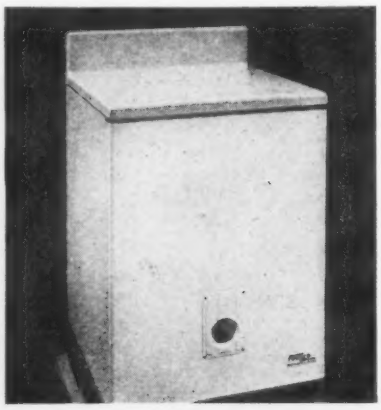
Leading jobbers stock attic fan timers by Paragon . . . maker of "A Timer For Every Need."

PARAGON ELECTRIC COMPANY
1616 Twelfth Street • Two Rivers, Wisconsin

Paragon Two Rivers WISCONSIN
BUILDERS OF ELECTRICAL EQUIPMENT . . . SINCE 1905

Water Heater Line (539)

Fowler Mfg. Co. has developed two new electric water heaters for its 1947 line—a table-top cabinet-size model and a 5-gal. junior model. The former has a 30-gal. capacity, stands 36 in. high, is 23½ in. wide and deep. It was designed to use with other table-top appliances in small, compact kitchens.



Heating Pad (540)

An Electric heating pad shaped to fit body curvatures is being manufactured by the Walker Co. Inc. According to the manufacturer, it can be used open or made smaller in shape by folding together; overall size is 8½x8½x2 in. This pad is equipped with an 8-ft. cord and plug. high and medium heat speeds are provided and a lower temperature can be secured by use of the heater inside its travel cover. Operates on 110-120 volts, a-c or d-c.

Electric Fan (541)

Westinghouse has entered the popular priced fan market with a 10-in. oscillating desk-bracket model, the Livelyaire. Finished in baked-on, dark green enamel, this fan is adjustable for wall mounting and has a reinforced one-piece welded steel guard. Arc of oscillation is adjustable to any angle from 0° to 75°. Motor is 115-volt, 60-cycle, 2,000 r.p.m. induction type. Over all dimensions: 14x11½x8¼ in.

Automatic Iron (542)

Winsted Hardware Mfg. Co. is featuring lower over-all height and light weight in its new Model 10 Durabilt automatic electric iron. This iron weighs 3 lb.; shell height is 1 in. It is claimed to reach full temperature in less than 60 sec. Use of soleplate alone to control heat is said to prevent overshoot of temperature in initial heating and to assure a tolerance of less than 20° at all times. Rated at 1,000 watts, 110 volts; will operate on 90 to 125 volts.

Range (543)

Crosley's new deluxe electric range features a spacious oven containing two non-tilting racks with safety stops and back-guards; waist high broiler; extra thick insulation to permit installation flush against walls; four fast surface units, including a 6-qt. deep-well cooker. The range has a one-piece top and receding lower front panel which slopes toward the floor, providing three inches of toe space. Oven and broiler door and utility drawers have concealed hinges, fit flush to front and sides of range. A one-piece welded frame supports the top sides and front and contains the ovens and drawers. Height is 42 inches without lamp assembly; working surface, 36 in. high; width 40 in.

Cleaning Equipment (544)

Landers, Frary & Clark is featuring a suction regulator and automatic rug-adjusting nozzle in announcements of its new line of conventional type vacuum cleaners. This regulator is said to prevent sealing or dragging, even on light-weight rugs; to operate without affecting cleaning efficiency of brush or change in motor speed. The conventional cleaner, VC5701, has a two-tone enamel finish with motor hood and handle of lustrous blue, blue twill bag; comes with 25-ft. cord, weighs about 26½ lb. A three position "touch toe" handle control allows change of handle position.

Other Universal home cleaning equipment includes two tank type cleaners, a floor polisher, hand cleaner, carpet sweeper.

ELECTRICAL WEST, 68 Post St., San Francisco 4, California
Please send me information about following CIRCLED items:

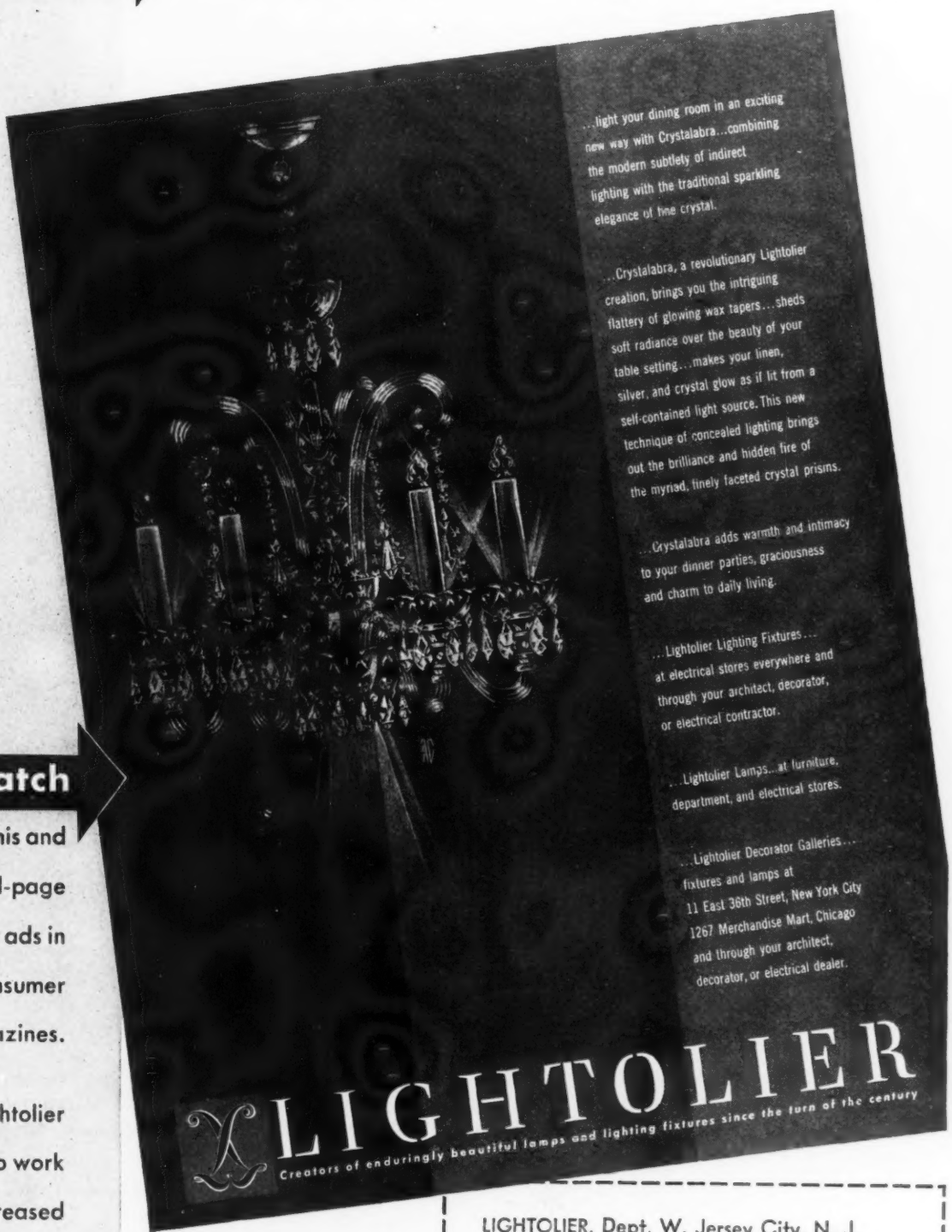
537 538 539 540 541 542 543 544

Name . . . . . Company* . . . . . Title* . . . . .

Address . . . . . .

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

LIGHTOLIER'S record-smashing consumer advertising is the beginning of a new profit plan for you


...light your dining room in an exciting new way with Crystalabra...combining the modern subtlety of indirect lighting with the traditional sparkling elegance of fine crystal.
...Crystalabra, a revolutionary Lightolier creation, brings you the intriguing flattery of glowing wax tapers...sheds soft radiance over the beauty of your table setting...makes your linen, silver, and crystal glow as if lit from a self-contained light source. This new technique of concealed lighting brings out the brilliance and hidden fire of the myriad, finely faceted crystal prisms.
...Crystalabra adds warmth and intimacy to your dinner parties, graciousness and charm to daily living.
...Lightolier Lighting Fixtures... at electrical stores everywhere and through your architect, decorator, or electrical contractor.
...Lightolier Lamps...at furniture, department, and electrical stores.
...Lightolier Decorator Galleries... fixtures and lamps at 11 East 36th Street, New York City 1267 Merchandise Mart, Chicago and through your architect, decorator, or electrical dealer.
LIGHTOLIER
Creators of enduringly beautiful lamps and lighting fixtures since the turn of the century

watch for this and other full-page Lightolier ads in national consumer magazines.

Put the Lightolier Profit Plan to work for increased sales.

mail this coupon *today*

LIGHTOLIER, Dept. W, Jersey City, N. J.
Tell me how I can put the Lightolier Profit Plan to work for *me*.

Name.....

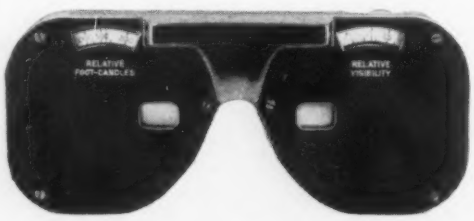
Address.....

City.....Zone.....State.....

Another General Electric

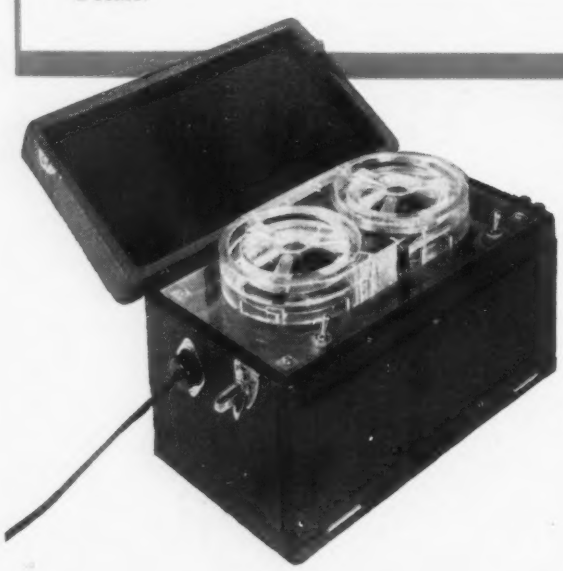
G-E LIGHT METER—A simple, convenient, low-cost device with numerous practical uses. Vest pocket size—only 2¼" square by 1⅛" thick. Has a full scale reading of 100 footcandles; with a multiplying plate, readings up to 1000 footcandles may be taken. May be used to measure reflection factor, transmission factor or brightness. Over 45,000 G-E light meters are now in use.

G-E LIGHT-SENSITIVE CELL—Has numerous uses in connection with light meters, reflectometers and colorimeters, as well as various control applications, including the control of street lighting. The G-E light-sensitive cell is a sturdy, inexpensive device which produces a measurable voltage in proportion to the amount of light striking its surface. May be equipped with a color-correcting filter, if desired.



LUCKIESH-MOSS VISIBILITY METER—Used generally for determining the relative visibilities of various objects and tasks. Meter consists essentially of two identical colorless circular gradient filters, which are rotated in front of the observer's eyes while he views the object or task. Filters reduce the object to threshold visibility, and measurement of relative visibility is indicated on a scale.

LUCKIESH-TAYLOR BRIGHTNESS METER—The most fundamental factors in seeing—brightness and brightness-contrast—are now made easily measurable by this remarkable instrument. Brightness of the test object can be read in both candles per square inch and in foot-lamberts. Scale reads from 0.0045 to 0.11 candles per square inch, also 2 to 50 footlamberts. Range can be extended to 50,000 footlamberts by multiplying screens.



LUCKIESH-HOLLADAY-TAYLOR ELECTROSTATIC BACTERIAL AIR SAMPLER—An efficient, convenient, portable instrument for collecting air-borne micro-organisms and measuring their concentration—or the average number of bacteria per cubic foot of air. It provides a highly useful means of demonstrating the need for and the effectiveness of installations of germicidal lamps in restaurants, school rooms, hospitals, etc.

LUCKIESH-TAYLOR GERMICIDAL ATTACHMENT—A simple device for adapting the standard G-E light meter for measuring the bacteria-killing energy produced by germicidal lamps. Consists of an appropriate fluorescent material placed between a plain piece of clear quartz and one of clear glass. Intensity of germicidal energy is measured in microwatts per square centimeter.

"Planned Lighting" Plus

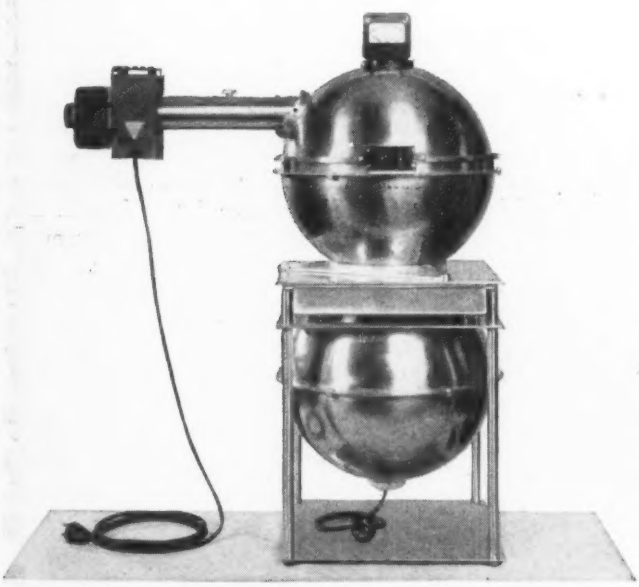
G-E Lamp Department has developed a full line of meters to help you demonstrate and merchandise better lighting

WE'RE in the *lamp* business. So our basic responsibility to consumers continues to be the production of an ever-increasing line of quality light sources for every purpose. But our job doesn't stop there. In many other ways the G-E Lamp organization works constantly to stimulate modern lighting practice in homes, stores, offices, factories and public institutions.

For example, General Electric Lamp engineers know the vital importance of convenient, accurate light measurement as a part of Planned Lighting. So they have developed a full line of meters for the complete analysis of illumination—both quantitative and qualitative. Typical G-E instruments are illustrated and briefly described on these pages. These Planned Lighting tools are available to you—at manufacturer's cost—for the use of your lighting specialists.

* * *

FOR ADDITIONAL INFORMATION *on G-E light meters for Planned Lighting, their application and prices, contact your nearby General Electric Lamp Office. Or write General Electric Lamp Department, Dept. 166-EW-5, Nela Park, Cleveland 12, Ohio.*



BAUMGARTNER REFLECTOMETER—A portable, moderately priced instrument for evaluating the reflection and transmission factors of translucent plastics, porcelain enamel, paint, acoustical and other materials of importance to the lighting profession. Operates independent of visual observation. May be used also to measure the reflection factor of walls and ceilings.

PROJECTION LIGHT METER—A handy portable instrument for projecting the standard General Electric light meter face on a screen. Facilitates demonstration to large groups. Projection meter may be used for taking readings up to 100 footcandles.

G-E LAMPS

GENERAL ELECTRIC

THIS MONTH'S NEWS

Winter's Coming in the Northwest

Maybe the total generating capacity of the Northwest power pool will be a little less than next winter's peak loads, according to reports at the meeting of Northwest power engineers in Portland. A lot depends on water; also, there's 600,000 kw. of aluminum plant load which might be trimmed in emergency to prevent more widespread inconvenience. Daylight saving and voltage dropping are other extremes. But operators in the pool are hoping, with their fingers crossed, that they can skin by . . . as to the aluminum load, it might fall off for economic reasons; demand for aluminum is slackening as supplies of other hard metals more nearly approach current requirements.

Blowing Hot and Cold

Westinghouse reports that a German scientist gave them this one. Air is blown through a nozzle so as to enter a pipe tangentially. After spiraling down the pipe, the air is emitted through two end openings, one at the pipe center, the other a circular one at the pipe circumference. The unexplained curiosity is that one of the exhaust streams is cold, the other hot. Westinghouse says further that no use for the device has as yet been found. Suggestion: ship one out West; there are several electrical men in the area who will know which end to connect to the hot water heater and which to the refrigerator.

More About Heat Pumps

Now with heat pump factories running at capacity turning out standard packaged jobs, the beginnings of a new era in heating may well be at hand. If really big-scale mass production should get under way, running prices down from the present $2,000 to around $1,000, there'd be places for heat pumps in many millions of homes. With most mechanical problems licked, heat-pump men are now concentrating on simple devices to extract heat from the earth. Drayer-Hanson (Airtopia) of Los Angeles, has an "earth root" which is a finned metallic conductor going down some 40 to 50 ft., with a water-circulating U-tube in the main stem of the root. Muncie Gear Works (Marvair) of Indiana, sinks a U-tube in a 4- to 5-in. hole drilled 200 ft. into the ground. Both eliminate the usage and disposal problems which would go along with any large-scale tapping of well water.

T-Week

Cities thinking about the inauguration of telecasting can take a lesson from Los Angeles' unhappy experience with what it called T-week. Customers by the dozens walked into dealers stores, cash in hand, expecting to buy a television set, only to be told there were none for sale. "Just demonstrators," said the dealers. Only a couple of manufacturers were ready with sets for sale. Tip-off is that of the industry total—200,000 sets in 1947—but 10% is allocated to the Los Angeles area. Demand could be five or ten times that figure . . . Telecasting in the San Francisco Bay area will not begin before January 1948. FCC permits have already bee issued on three of the six channels allotted to that area A fourth application is on file . . . Requisite to networ telecasting in the West is completion of the coaxial cabl to be installed by Pacific Tel. & Tel. Co. from southern California to the Pacific Northwest. The Los Angeles San Francisco link will not be finished until mid-1949.

Prescription for TVA: A New Slate

Most important size-up of TVA since its inauguratio 14 years ago is the audit report recently issued by th General Accounting Office. Among other things th report rejects the famed "yardstick" rate theory as "no to be compared with private power corporations' opera tions." It also recommends several changes in the TVA law to clarify accounting and financing so that prope expenses chargeable to power operations are shown, in cluding such items as interest on $400,000,000 of capita investment, federal income taxes and certain depreciatio charges.

Who Planned What?

Careful study of the U. S. Bureau of Reclamation six-year power program recently unfolded in a report t Congress will cause some eyebrow-raising. Include among the 2,752,800 kw. of proposed and potential hydr projects to be constructed by this federal agency an several that up to now have been integral units in th planning of some of the West's great utility systems. Th map accompanying the report, when viewed by one no familiar with the facts, might lead him to the conclusio that the USBR alone was responsible for the present an future power plant and transmission line developmen of the Far West.

Going, Going—

Sub-miniature electronic circuits are, according to th Bureau of Standards, being made even more so by prin ing the circuit right on the tube envelope. Still furthe reductions are being worked on, they say, but leave th public guessing as to what that means.

Weather Patterns Available

Industrial climatology or projecting long-range weathe patterns is a new service for industry contemplated b the U. S. Weather Bureau. No forecast, these pattern can be useful in locating a new factory and in buildin and product design and construction. In the meantim Prof. Krick of CalTech, whose long-range forecasts wer helpful to utilities before the war, is setting up an inte national forecasting service.

Snow

First surveys show below average seasonal wate throughout the West. Most southern regions face a dr year with less than half normal water. The situation im proves progressively as one moves north; at least averag flows in major drainage areas of the border states an British Columbia appear probable.

A PHENOMENAL NEW DEVELOPMENT IN DESK LIGHTING!

All-metal Construction
Luxurious Bronze Finish
Shatterproof POLAROID Filter

MODEL NO. 1010
Uses two 15-watt fluorescent lamps
For A. C. operation only

Absolutely Glare-Free 100% Useful Light!

THE AMAZING NEW

MITCHELL

POLAROID* FLUORESCENT DESK ILLUMINATOR

*T. M. Reg. U. S. Pat. Off.

A DRAMATIC LIGHTING STORY TO TELL!
A DRAMATIC LIGHTING PRODUCT TO SELL!

Here is a new, spectacular form of desk lighting that sells on SIGHT—because it delivers a new kind of *seeing* light! The POLAROID Desk Illuminator, made exclusively by MITCHELL, combines for the first time the use of fluorescent lighting with dramatic POLAROID glare-eliminating material. The result is a revelation—*the only truly glareless, comfortable, 100% useful light ever made available for desk lighting!*

A simple 2-minute demonstration of this amazing new lighting does a dramatic selling job for you. You can show your customers, before their very eyes, how the concealed POLAROID filter actually TRAPS and ELIMINATES the glare-producing light, delivering only the useful "vertical" rays to the desk surface. Under this glareless, even light, print, pictures and writing stand out plainly, clearly. Colors are enriched. Glare is gone—entirely! Eyes stay clear, unstrained, comfortable through even the longest day's work.

In the POLAROID Desk Illuminator, MITCHELL presents an exclusive combination of perfect desk illumination with magnificent styling—offers you the most dramatic "selling package" in lighting history. Get the full details today!

Just SEE the DIFFERENCE in these actual unretouched photographs!

Made Exclusively By

MITCHELL

FOR ALL WHO READ OR WORK AT DESKS

Executives	Accountants	Doctors	Engineers
Secretaries	Bookkeepers	Lawyers	Draftsmen
Office Clerks	Students	Teachers	Artists, etc.

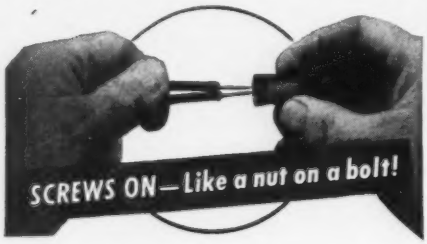
Mitchell Manufacturing Company
2525 CLYBOURN AVENUE, CHICAGO 14, ILLINOIS
In Canada: Mitchell Manufacturing Company, Ltd., Toronto, Canada
Far West: *Complete Modern Plant and Sales Office at Los Angeles Serves the Entire Pacific Coast Area*
1019 NORTH MADISON AVENUE, LOS ANGELES 27, CALIFORNIA

IDEAL

Wire-Nuts*

(THE SOLDERLESS, TAPELESS WIRE CONNECTORS)

Thousands of electrical contractors have proved to themselves how "Wire-Nuts" save money and speed work on rough-ing-in fixture wiring, maintenance, repairs, etc. Try "Wire-Nuts" on your next job and be convinced.



Just one simple operation is all that's required to join any usual combination of wires with a "Wire-Nut"—no twisting of wires—no soldering—no taping. You do it faster and easier, at the same time making a joint that's better electrically, stronger mechanically; safe, neat, compact, non-corrosive. Ideal "Wire-Nuts" are listed by Underwriters' Laboratories. BUY "WIRE-NUTS" FROM YOUR JOBBER NOW.

IDEAL INDUSTRIES, Inc.
Successor to Ideal Commutator Dresser Co.
1042 Park Ave., Sycamore, Ill.

*Trade Mark Reg. U. S. Pat. Off.

Mail for FREE SAMPLES

IDEAL INDUSTRIES, Inc.
1042 Park Ave., Sycamore, Ill.
Send Free Samples, Application Manual and cost data.

Name_____

Address _____

City _____ Zone ___ State _____

USBR REPORT ALLOCATES CENTRAL VALLEY COSTS

Sixty-one per cent of the initial cost of the Central Valley project would be paid through sales of electric power under recommendations in a USBR allocation report submitted to Congress. Approved by President Truman and Secretary of the Interior Krug, the report would charge 28% of the $384,314,000 total to Central Valley farmers and 11% to water sales.

Included in the $384,314,000 bill are Shasta and Keswick dams, with the electrical plants and transmission systems and the Delta steam plant; Friant Dam and Delta cross-channel, and the Contra Costa, Delta Mendota, Madera and Friant-Kern canals.

It was estimated that the entire project would be paid for 44 years after it is in full operation, if Congress approves the recommendation of the Interior Department.

A power rate of 4.57 mills per kwh. is used in the calculations, with 2.5 mills for project pumping demand. Average water price for firm supply is projected as $2.70 an acre foot and $1.45 for secondary supply.

Estimated costs of the project include $199,661,000 for irrigation features; $104,143,000, power; $9,091,800, municipal water; $3,074,600, Contra Costa Canal distribution system, and $18,851,900, future canal capacity.

Court Orders Review in Condemnation Case

Washington State Supreme Court has ordered a review of condemnation proceedings against Northwestern Electric Co. properties in Clark County, Wash., in which the PUD had been issued a decree of "public use and necessity."

By a vote of 5 to 4 the court denied a superior court motion to quash a writ of certiorari petition made by the company. Previously a five-judge decision of the supreme court had sustained the lower court.

In the majority opinion, written by Justice William J. Millard, it was contended that the statute permitted no other form of appeal except by writ of certiorari and that this entitled the company to a writ as a "matter of right."

The dissenting opinion, written by Justice W. E. Schwellenbach, held that if relief from the proceedings were not adequate the company should apply to the state legislature for relief rather than ask the court to overrule cases which have been the law of the state for 30 years.

A SERVICE THAT ATTRACTS THE PROGRESSIVE INDUSTRIALIST
THE OHIO
MOTOR CHARTING SERVICE
Our engineering department is capably staffed to make a survey of all motors and generators in your plant and to recommend the proper brushes to be used in each case and compile all technical data into book form for your references. It will be your guide to efficient operation and increased production.
IT'S ABSOLUTELY FREE OF CHARGE!
West Coast Representative
C. F. BOWERS
544 S. San Pedro St., Los Angeles 13, Cal.
THE OHIO CARBON COMPANY
12508 BEREA ROAD
CLEVELAND 11, OHIO

H. H. Van Luven
307-09 East Third Street
Los Angeles 13, California
MUtual 5173
Manufacturers' Representative
Representing

CONNECTICUT TELEPHONE & ELECTRIC DIVISION
Hospital Signal Systems — Annunciators — Intercommunication equipment, etc.

LENZ ELECTRIC MFG. CO.
Lead—Braid Covered Cables and Wires—Tinsel and Copper Cordage—Special Cables

SIGNAL ENGINEERING & MFG. CO.
Relays—Bells—Horns—Code Call Systems—Fire Alarm Systems

HART MANUFACTURING COMPANY
Remote Control Equipment — Switches — Relays—Thermostats

HAZARD-OKONITE COMPANY
Copperweld, Bronze, Copper, Telephone Wires

TRICO FUSE MFG. CO.
Fuses, Oilers, Clip Locks and Fuse Pullers

BURKE ELECTRIC COMPANY
Bakelite Controlead Terminal Blocks

NAME OF MANUFACTURER
COMPLIANCE WITH SPECIFICATIONS UNDER APPROVED INSPECTION PROCEDURE OF RLM STANDARDS INSTITUTE CERTIFIED BY ELECTRICAL TESTING LABORATORIES, INC.
RLM

The meaning of the RLM label to *BUYERS....SPECIFIERS....SELLERS* of Industrial Lighting Equipment

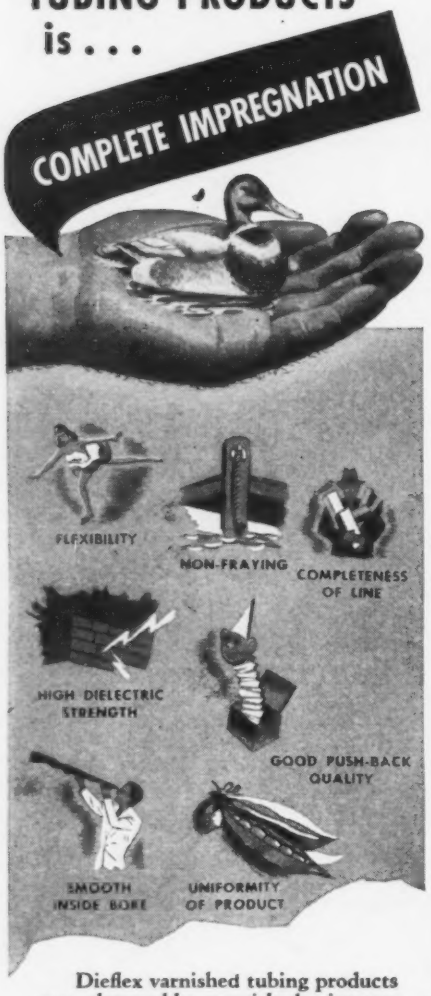
This RLM Label affixed to an industrial lighting unit certifies that the unit has been manufactured to conform to RLM rigid specifications. RLM Specifications are drafted by a Technical Committee, guided by the findings of the *Illuminating Engineering* Society, the recommendations of the *Better Light—Better Sight Bureau,* and other recognized industry associations. These factors that provide (1) *Economy through more* Light at No Extra Cost, (2) Low Maintenance Cost and Long Life.

Whether you buy or sell industrial lighting, play safe by specifying lighting equipment built to conform to up-to-the-minute RLM Specifications and bearing the RLM Label. Copies of all the latest RLM Specifications may be secured through any manufacturer using RLM inspection and certification service, or direct from RLM Standards Institute.

RLM STANDARDS INSTITUTE
INCORPORATED

307 N. MICHIGAN AVENUE SUITE 420 CHICAGO 1, ILLINOIS

1st Among the Features of DIEFLEX VARNISHED TUBING PRODUCTS is . . .



Dieflex varnished tubing products are thoroughly varnished—impregnated to protect against moisture, oil, heat, and high voltages. Their smooth inside bore permits easy threading, prevents snagging, and speeds assembly. Ideal for use where extreme flexibility, non-fraying quality, and complete roundness are important.

Prompt shipments usually available from stock.

TRI-STATE
SUPPLY CORPORATIONS

544 SO. SAN PEDRO ST.
LOS ANGELES 13, CALIF.
MU. 2354

554 BRYANT STREET
SAN FRANCISCO 7, CALIF.
EX. 8890

318 OCCIDENTAL AVE.
SEATTLE 4, WASHINGTON
MA. 4161

Three Complete Warehouse Locations!

REFERENDUM ASKED ON OREGON AMENDMENT

Preliminary petition was filed in Oregon for referendum of the amendment to the state hydroelectric act permitting power companies to retain dams for their full license period (passed by the legislature over the governor's veto, EWEST, March, p. 96). Sponsors of the referendum move are the Oregon State Grange and the Oregon Farmers' Union; 11,856 qualified signatures are required to place it on the 1948 general election ballot.

Designed to protect dam owners against condemnation proceedings during the license period, the bill was introduced by eastern Oregon legislators to clear the way for construction by Idaho Power Co. of a $12,000,000 dam across the Snake River in Oregon. Pending outcome of the referendum issue, the power company has halted preliminary work on the dam.

Nevada to Take Over Basic Magnesium Plant

Legislative bills calling for the construction of a state-owned generator at Boulder Dam and state acquisition of Basic Magnesium Industries in southern Nevada have been signed by Gov. Vail Pittman.

Both authorize the Colorado River Commission to take the steps necessary to carry out provisions of the bills.

Tentative agreements call for construction of the generator by the Bureau of Reclamation, its cost to be repaid over a 20-year period from revenue obtained by power sales. The state was allotted space for such a generator in the original Boulder Dam agreement.

Washington PUD Bills Killed in Committee

Although ten bills limiting PUD authority were acted upon in committee during the recent session of the Washington state legislature, only one was reported out. Killed when the house refused to consider it, the bill proposed suspension of PUD eminent domain proceedings for the next two years while a commission studied all phases of the state power set-up.

A bill which would have required PUDs to get approval of the department of public utilities for every purchase of more than $5,000 was killed by unanimous vote. Another bill, which would have created a bi-partisan public utilities commission, was recommended by the house public utilities committee but failed to get out of the rules committee.

Other measures killed would have required public sale of PUD bonds; prohibited a PUD from disposing of any property inside or outside its boundaries to another PUD without approval of the voters of such district, and allowed dissolution of a PUD by vote at the next general election after 10% of the qualified voters of such district had petitioned.

Arizona Body Rejects FPC Rate Survey Claim

Arizona Corporation Commission will not approve a $450 FPC claim for preliminary work in connection with the utility rate base survey, according to a letter from Wilson T. Wright, state commission chairman, to Nelson Lee Smith, FPC chairman.

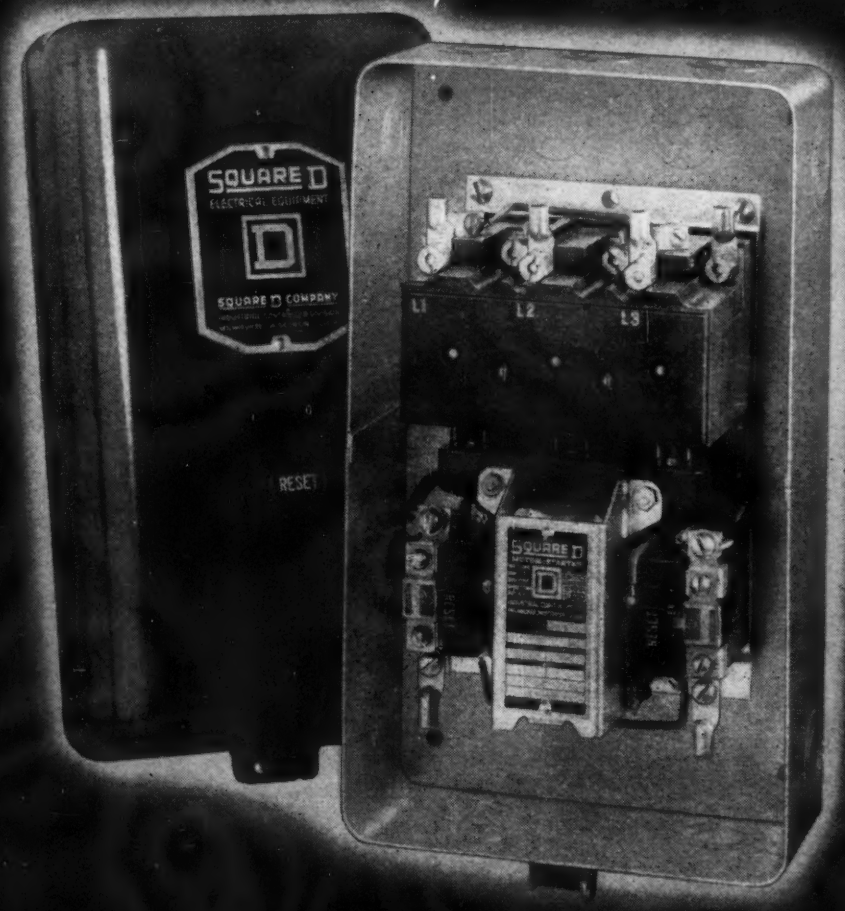
Wright's statement was in answer to advice from Smith, that unless the state commission paid the claim for services of Edward L. Dunn, FPC rate expert, in Phoenix last December, FPC would ask the Treasury Department to withhold an equal sum due Arizona from public receipts.

Wright contended that expenditure of public funds should be deferred until a court decision is reached on constitutionality of the $50,000 legislation power survey appropriation act. If the appropriation is upheld, "we will be very pleased to consider the claim, and if it appears Mr. Dunn's trip was of value to the state, to then take action upon it," Wright declared.

● A $14,000 annual rate cut was ordered for Eloy district farmers by the Arizona Corporation Commission. The reduction came after several postponements of the hearing on Elroy Light & Power Co. rate structure. Charles Reed, utility attorney, protested the decision, arguing that negotiations for the sale of the Eloy properties to Trico Electric Cooperative had delayed preparation of briefs for the rate hearing. Eloy Light & Power Co. is presently involved in suits in Pinal County Superior Court, one questioning validity of the sale to Trico and the other seeking the Eloy property by condemnation.

● A BILL to limit elections for formation of PUDs to general election dates was passed by the Oregon legislature and sent to the governor. The bill, which does not ban special elections by established PUDs, was introduced to curb the practice of public power enthusiasts to force repeated elections, sometimes only a few months after defeat.

Performance Plus



Class 8536 A. C. Magnetic Starter — one of a complete line of Square D starters available in a wide range of sizes and enclosures.

with SQUARE D Starters

They are simply designed. Magnet coils, contacts and overload relays can be changed quickly, without disturbing external connections. They are compact, yet afford generous wiring space and easy-to-reach terminals. Installation and inspection are faster and easier. And—completeness of line (both A. C. and D. C.) means the right starter for any given application.

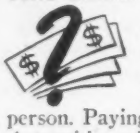
Wherever Electricity is Distributed and Controlled

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

Money Safe from Loss or Theft!

When You Use a Special Checking Account of This Bank



Eliminate the risks of keeping large sums of money at home or on your person. Paying by check is safer than with cash. Open a Crocker First National Bank Special Checking Account. The only cost is for the checks you buy — in books of 10 for $1 — as you need them. Open your account today then use our Mailway Banking Service.

CROCKER FIRST NATIONAL BANK

SAN FRANCISCO • OAKLAND

California's Oldest National Bank

Member Federal Deposit Insurance Corporation

ALL the strength and durability inherent in steel are combined---with definite economies---in Crapo Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide lasting protection against corrosion.

Ask the distributor of Crapo Galvanized Products near you or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

AGENCIES COOPERATE TO SAVE ARIZONA CROPS

Facing a water shortage again this year, private and public power agencies in Arizona are cooperating to supply power to pumping operations in the central part of the state.

Bureau of Reclamation is making a temporary installation of five transformers at the Parker Dam switchyard to deliver additional power through interconnections with systems of Central Arizona Light & Power Co. and Salt River Valley Water Users Assn. Two 40,000-kva. transformers have been borrowed from the Oak Ridge atomic energy plant, and three 25-000-kva. units were being moved last month from Basic Magnesium plant at Henderson, Nev.

Increased switching capacity at Parker will permit a pick-up from Boulder Dam. Meanwhile, work is being rushed on the Phoenix-Eloy section of another Phoenix-Tucson transmission line.

As was the case during last year's drought, additional energy will be secured through interconnection with steam plants in the Los Angeles area.

● A NEW ORDER allocating territory in the Yuma, Ariz., area between the Arizona Edison Co. and California Electric Power Co. has been adopted by Wilson T. Wright, chairman, and William T. Brooks, member, of the Arizona Corporation Commission. The new order superseded one adopted last year before W. J. Eden was replaced on the commission by Brooks.

● CENTRAL NEW MEXICO ELECTRIC COOPERATIVE Inc. will build a 900-kw. electric generating plant at Corona, N. M., as soon as building materials and equipment are available. Funds for the diesel plant and 401 miles of distribution lines were provided by a $707,500 loan recently obtained by the co-op from REA. The co-op will serve retail consumers in Torrance County and part of Lincoln County.

● KLICKITAT COUNTY (Wash.) PUD No. 1 took over distribution facilities of Pacific Power & Light Co. in the county on April 2. The district paid $684,827 into federal court in Spokane, under decrees of appropriation. An REA grant of $770,000 was awarded the district recently.

● CENTRAL ARIZONA Light & Power Co.'s plan to purchase the Parker Electric Supply system was protested in petitions filed last month with the Arizona Commission. Protest was instigated by Nyco Electric Co-op.

● TO INFORM all employees of Utah Power & Light Co. of the company's facts and philosophy, to explain the mutuality of interest between company and employees, three series of employee meetings were launched last month. George M. Gadsby, president, started the series by discussing the company's *Economic Foundations*. The second series is on *Power Supply* and will be addressed by J. A. Hale, vice-president; T. A. Purton, chief engineer, and E. M. Naughton, assistant to the vice-president. Dr. Adam Bennion, vice-president and personnel director, will conduct the final series on *Mutuality of Interests*. The series started March 20 and ends May 16.

● APPROXIMATELY 40 million feet of surplus, government-owned electrical wire and cable worth ten million dollars (new cost) are being offered for sale by War Assets Administration on a competitive bid basis. Although located in most of WAA's regional offices, largest inventories are held in New York, Los Angeles and San Francisco. Detailed information may be obtained in these offices.

● ANOTHER in the series of power market studies has been prepared by Bonneville Administration, covering Grays Harbor County, Wash. The survey was written by members of the BPA staff in cooperation with the Aberdeen and Hoquiam chambers of commerce and is available from the administration's division of industrial and resources development in Portland, from the Puget Sound district office in Seattle, or from the Aberdeen and Hoquiam chambers of commerce.

● SEATTLE, WASH., city council has approved a request from E. R. Hoffman, superintendent of City Light, for purchase of chemicals to destroy fast-growing trees along City Light's high voltage-transmission lines. Hoffman told the committee that new type chemicals, which would be sprayed on such trees as alders and willows, could be applied for $25 to $30 an acre, while manual clearing costs about $90 an acre. An appropriation of $50,000 was made for the entire program.

● CAPACITY of the electric generating plant at the Kennecott Copper Corp. mill, Arthur, Utah., will be doubled when projected installations go into operation. Foundations have now been placed for two new 25,000-kw. generators and another boiler, with auxiliary pumps and other equipment. The new equipment, to cost $3,000,000, will make the plant one of the largest industrially owned power stations in the West.

SEATTLE PROGRAM TO PRESERVE FISH LIFE

Seattle City Council Utilities Committee has adopted a recommendation by Superintendent E. R. Hoffman of City Light that the city concur in a program worked out by state, federal and city agencies to aid in the prevention of damage to fish life in the Skagit River by City Light dams.

The state fisheries department had charged the three City Light dams—Diablo, Gorge and Ross—have created low water conditions destructive of fish life in the river.

Under the agreement, City Light will put up $54,950 for five salmon rearing ponds and two steelhead trout rearing ponds at a hatchery the state will build and operate near Marblemount. In addition, City Light agrees to so regulate the flow of water past the Gorge Dam that it will at no time be less than either 1,000 c.f. per second or the natural river flow if there were no dams. For every day the flow is below these minimums, City Light will pay the state $70, or $280 per day if the flow is less than 230 sec. ft.

Dam Dynamited So Steelhead Can Spawn

Carrying out an abatement order signed by a Washington superior court, Bert Ulrie and Arthur Coulter, engineers for the state game and fisheries department, supervised the blasting of the Western Light & Power Co. Cottrell Dam on the Washougal River. The structure was dynamited to allow steelhead in the river to reach their natural spawning ground this spring. Its destruction followed several years of litigation. WL&P's gross revenue from power generated at the dam in 1946 was $1,700.

• AN AGREEMENT "in principle" has been reached in the wage dispute between the Seattle city council and the Electrical Workers' Union, Local B-77. The council agreed to recognize the union's 1947 contract with Puget Sound Power & Light Co. as a standard for City Light workers, with the city's scale exceeding the private company's slightly. The union's new contract with Puget Power increases linemen's pay to $14.40 a day, a $1.44 increase over 1946. Councilmen took a firm stand against inclusion of warehousemen and clerical workers in the present agreement, since other city employees in those classifications would not be affected. A survey is being made of all city positions and upward salary revision will be considered, it was stated.

BUCKINGHAM
BAGS... POUCHES... and BELTS

. . . provide the safe and handy way to carry all hand tools . . . whether you are running a line or doing inside wiring, panel or bench work. Many new and convenient units have been added to the Buckingham quality line . . . many which you can use and will want. Write for new illustrated folder!

BELT SUPPORT A new, more comfortable and practical belt support that permits greater freedom of arms and shoulders . . . safer . . . less likely to entangle with any work. Cat. No. 257.

LINEMAN'S TOOL POUCH

Rugged leather pouch, stoutly riveted and stitched. Carries rule, pliers and knife. Cat. No. 651

TOOL HOLSTER NO. 650

One large, two small, and two deep wing pockets for various tools. Knife snap optional on all Buckingham tool pouches and holsters.

LEATHER TOOL BAG NO. 303

Made of heavy, durable leather. Stoutly stitched and riveted to give years of service. Convenient for carrying emergency kit, repair tools, work clothes, etc. 15" long by 6½" wide x 7" deep.

ELECTRICIAN'S BELT NO. 85

Made of 1½"-wide durable leather. Fitted with nickel plated buckle, snap, tapeholder and tool loop. Accommodates Buckingham tool pouches and holsters.

RUBBER GLOVE BAG

8/0 vat-dyed olive drab duck. 16" x 8" x 4". Provided with belt snap. Keeps gloves dry and clean, and you can't lose them off your belt. No. 400

Write today FOR NEW ILLUSTRATED FOLDER ON MECHANICS POUCHES!

BUCKINGHAM STEPHENS BINGHAMTON N.Y.

BUCKINGHAM MANUFACTURING CO., INC.
Walter E. Craw, Pres. 5-7 Travis St., Binghamton, N. Y.

PGE ADOPTS LARGEST SINGLE-YEAR BUDGET

Portland General Electric Co.'s board of directors has approved a 1947 new construction budget of $5,500,000.

Some of the larger items are: $651,000 for work on the existing hydroelectric plants; $378,900 for high-voltage and transmission and subtransmission lines; $890,000 for high-voltage transformation, switch and bus structures, and $812,000 for distribution improvements, consisting chiefly of new distribution substations.

The company plans to spend $102,900 on street lighting in Portland, Salem, Oregon City and other communities. A demonstration street lighting laboratory will be set up for the aid of towns and cities in determining their choice in new lighting equipment.

The budget is the largest ever adopted by the company for a single year and exceeds the 1946 total by approximately $2,000,000.

● CITY OF PROVO will spend $1,000,000 on a program to more than double present generating capacity. A 7,500-kw. generator will be installed in a new wing of the city power plant, and is expected to go on the line in December 1948. Financing will be partly from the utilities depreciation reserve and partly from revenue bonds.

● APPLICATION of the Benton-Lincoln Electric Cooperative for permission to construct a power line in southwestern Marion County, Ore., has been approved by the Marion County court. The line, which will extend over a distance of 40 miles, is part of a five-county project representing a federal investment of $2,500,000 and ultimately to serve 3,000 families. Power for the Marion County project will come from BPA's Albany sub.

Bonneville Crews Start Snohomish Substation

Bonneville construction crews last month started clearing and grading at the site of the agency's $2,700,000 Snohomish substation. This 250,000-kw. station will bring more power into the Puget Sound area and will serve as the main operating, maintenance and patrol center of all BPA lines and stations for the area north of Seattle and between Puget Sound and the summit of the Cascades.

First step in construction will be installation of a 150,000-kw. transformer bank at the station and construction of a 2-mi., 230,000-volt double-circuit loop from one of Seattle City Light's Diablo-South substation lines to the new BPA station. Ultimate plans call for at least four 230,000-volt circuits with western terminus at the substation.

● REA has authorized a $215,000 loan for the Blachly-Lane County Cooperative in western Lane County, Ore. The co-op plans to spend part of the money for distribution lines, and will strengthen the existing line between Bonneville's Eugene substation and Blachly.

SAN DIEGO ORDERS SILVER GATE UNIT

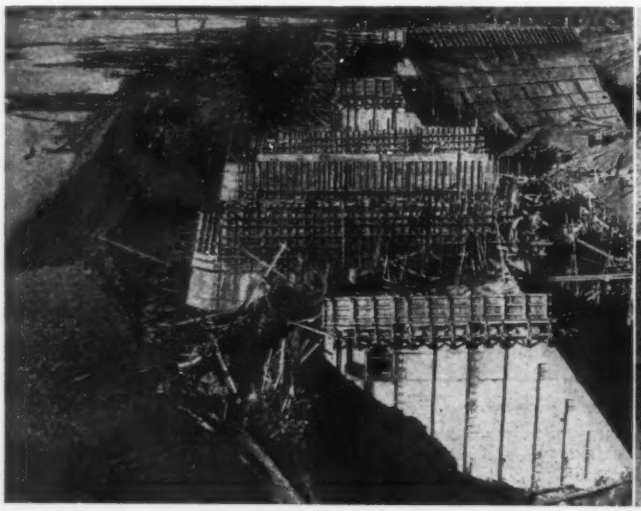
San Diego Gas and Electric Co. has placed an order for a third 50,000-kw. steam turbogenerator for its Silver Gate generating station, according to an announcement by President L. M. Klauber at the stockholders' meeting April 22. The second unit, now under construction, will be completed soon and delivery of the third generator is scheduled for 1950, he said.

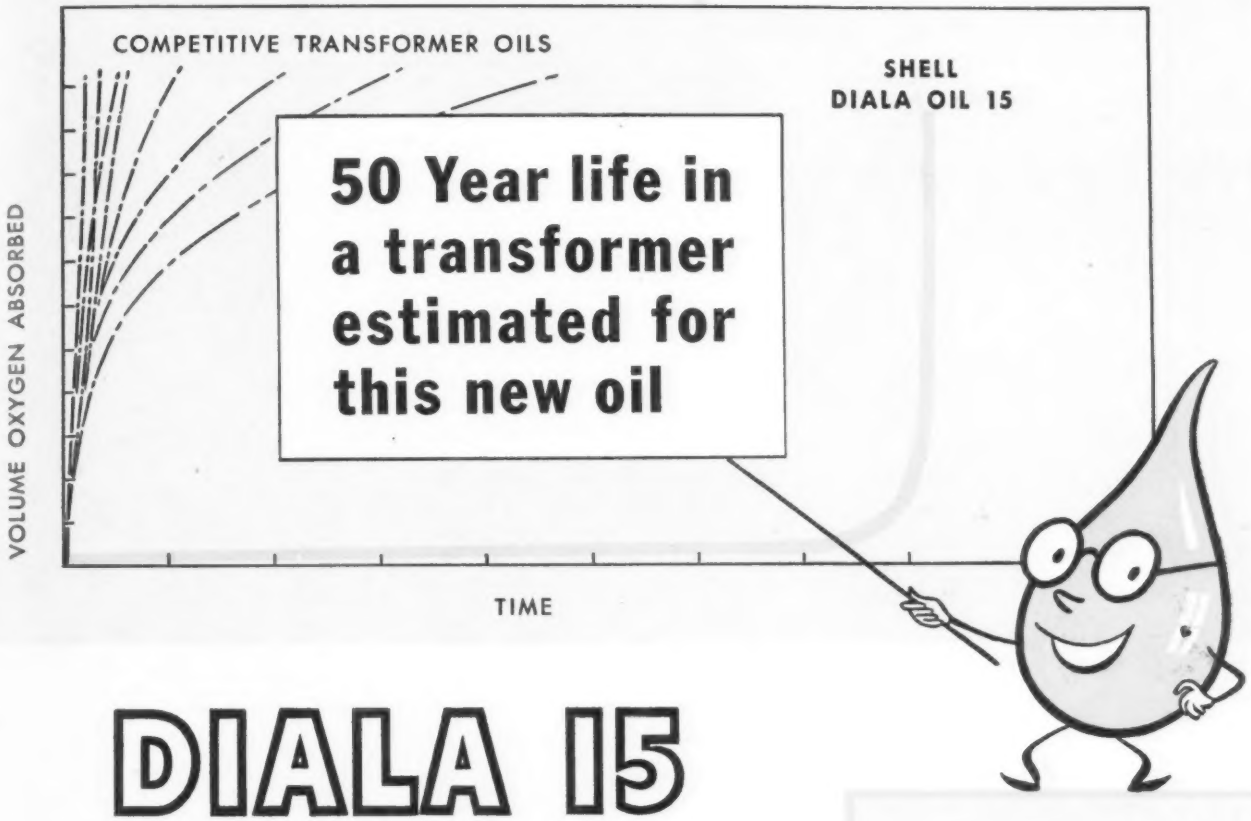
The company has scheduled a $19,000,000 construction program for the next two years, Klauber stated. The largest budget in the company's history, the expenditure is a marked contrast to the $2,000,000 worth of construction per year completed during the war. Included in the construction is a 26-mi., 66,000-volt transmission line between El Cajon and Descanso to augment the company's facilities now serving San Diego's rural area. Within two years the company hopes to complete a transmission loop circling the county that will provide improved service for all principle back country areas, he said.

Klauber said that more than 4,900 applications for new electric service are on file with the company.

● TACOMA's Second Nisqually Power development already has paid off more than one-fourth of its $22,686,238 cost, C. A. Erdahl, public utilities commissioner, reported. The annual financial report showed Tacoma City Light spent $166,411 on purchased power in 1946, compared to $1,036,144 in 1945, before the first unit began operating.

Construction pictures showing main dam (left) and coffer dam for the B. C. Power Commission's Campbell River development. Authorization has now been granted for four 25,000-hp. generating units in the power house. Construction of Ladore Falls storage dam at a cost of $1,145,000 will raise the water level of lower Campbell River 58 ft. to provide storage regulation for the 100,000 hp.





DIALA 15

Resists oxidation in accelerated tests 140 times longer than next best transformer oil

For three solid years Shell chemists sought a transformer oil sufficiently oxidation-stable to overcome sludging—worst enemy of this type of coolant. Shell Diala Oil 15 is the result—an achievement that *far surpasses* the original goal.

For, so unprecedented is its oxidation resistance that—judging by accelerated tests—Diala 15 can last 50 years in a transformer!

Moreover, Diala 15 proved less damaging than ordinary oils to linen and cotton insulating fabrics. It has excellent thermal transfer properties and insulating value . . . low pour point . . . minimum volatility. And it's equally dependable for protecting oil-filled switches and oil-insulated cables.

Here's what the chart shows

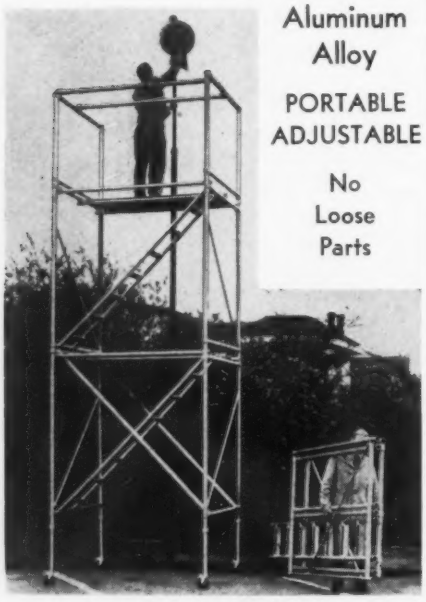
In order to compare oxidation resistance of Shell Diala Oil 15 with other new and reclaimed oils, a special machine was developed to measure the amount of oxygen absorbed under selected temperatures. The above chart of the test shows that the best competitive oil absorbs oxygen 140 times as fast as does Diala Oil 15. On the basis of this accelerated test, it is estimated that the life of Diala Oil 15 in a transformer could be 50 years.

CALL THE SHELL LUBRICATION EXPERT AS THE FIRST STEP TO THE RIGHT SOLUTION OF ANY LUBRICATION PROBLEM

SHELL DIALA OIL 15

SHELL®

"How we saved $400 on a single job."
SAYS MR. X—BY USING AN
UP-RIGHT SCAFFOLD



Aluminum Alloy
PORTABLE ADJUSTABLE
No Loose Parts

WRITE FOR DESCRIPTIVE CIRCULAR
UP-RIGHT SCAFFOLDS
BANK OF AMERICA BLDG.
BERKELEY 4, CALIFORNIA

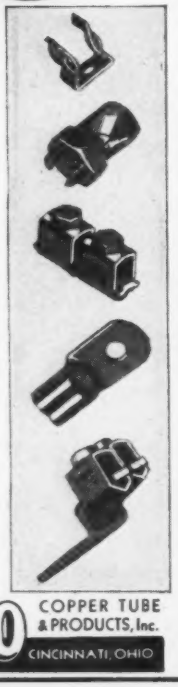
ILSCO OPERATES ITS OWN TUBE MILL
ILSCO
LUGS AND CONNECTORS

Economy
FOR EXAMPLE:
ONLY SIX SIZES FOR 16 WIRES
No. 14 to 1,000,000 c.m. inclusive

EVERY connector can be used over and over again. Minimum wiring time . . . lower wiring costs.

Write for 48-page illustrated catalog.

Western Distributors:
Electrical Specialty Co.
Seattle—San Francisco
Strieby & Barton, Ltd.
Los Angeles



ILSCO COPPER TUBE & PRODUCTS, Inc.
CINCINNATI, OHIO

USBR CONTRACTS COVER WESTERN HYDRO PROJECTS

Construction of two federal hydro-electric generating plants and equipment for four others are provided in contracts recently awarded by the Bureau of Reclamation.

The Estes and Marys Lake plants on Colorado's Big Thompson River will be built by Morrison-Knudsen Inc., and Peter Kiewit Sons Co. of Denver at a cost of $2,176,708. Terms of the contract call for completion of the plants, including switchyards, penstock gate structures and penstocks, within 30 months after work starts. The Estes plant will have an installed capacity of 45,000 kw., and a single generator of 8,100-kw. capacity will be erected at Marys Lake.

Electrical control equipment and a power switchboard for the Heart Mountain plant in northwestern Wyoming will be supplied by Control Corp. of Minneapolis, under a $51,723 contract. Construction of the plant, which will have an installed capacity of 5,000 kw., already is under way.

Generators and penstocks for the Kortes power plant on Wyoming's North Platte River will be supplied through two contracts. The Elliott Co. of Jeannette, Pa., will build three 12,000-kw. generators for delivery within 22 months at a cost not to exceed $668,064. Three welded-plate steel penstocks, costing $85,224, will be delivered within six months by the Darby Products of Steel Plate Corp., Kansas City.

Power cable for the Keswick and Shasta power plants in California's Central Valley were ordered from the General Electric Co. under a $73,092 contract. The Willamette Iron and Steel Co. of Portland, Ore., will supply high-pressure gates for the penstock structure at the Estes power plant.

Contract for furnishing the structural steel coffer dam for maintenance of the spillway apron at Shasta Dam was awarded to the American Bridge Co., Denver, for $197,636.

● A Federal District Court Jury in Yakima, Wash., awarded the Priest Rapids Irrigation District $473,356 for its power plant facilities, in condemnation proceedings brought by the government to determine the value of property taken for the Hanford atomic energy plant near Richland, Wash. The value set by the jury was higher than the appraisal of government witnesses.

● California Electric Power Co., Riverside, has announced plans to spend about $7,000,000 during the next two years for added facilities and expansions.

NEW!

IF YOU USE FUSES you'll want this valuable 24-page quick-reading, profusely illustrated booklet—containing a complete explanation of fuse designs. It tells you how to get THREE TIMES THE SERVICE with less cost and less worry. It's FREE for the asking—Write for your copy today!

TRICO FUSE MFG. CO. Milwaukee, Wis.

ARE YOU ACQUAINTED WITH KELLEM'S PRODUCTS?

KELLEMS PULLING GRIPS for pulling heavy, underground cables — standard throughout the industry.

KELLEMS SPLIT CABLE GRIPS used in shifting an operative cable or one where the end is not accessible and the grip must be laced on.

KELLEMS SLACK CABLE GRIPS used for pulling slack in the manhole and for pulling out old cable.

KELLEMS JUNIOR GRIPS universally used by Electrical Contractors in wiring buildings. Central Stations use them for pulling control cables and underground service cables.

KELLEMS SERVICE CABLE SUPPORTS, used for permanently supporting service entrance and service drop cables. Will not split thru wedging as pressure is applied to the full 360° of the cable circumference.

KELLEMS RISER CABLES. Bronze wire grips used to support weight of Riser Cables, anchor cables on grades, and support weight at floor levels in tall buildings and elevator shafts.

STOCKS CARRIED IN SAN FRANCISCO

SEND US YOUR INQUIRIES

GEO. E. HONN CO.
420 Market Street San Francisco 11, Calif.
Phone: SUtter 7352

NOTES ON THE TRADE

● PACIFIC ELECTRIC MFG. Corp., San Francisco, has leased a plant in San Jose, Calif., for manufacture of high-voltage switches. Capacity production is expected to total $3,000,000 annually. Robert Byrne, production control manager, heads the San Jose operations. Harold Aherns is foreman of manufacturing operations and John Cologne is foreman of fabrications.

● R. B. CLAPP Co., Los Angeles representatives of the Automatic Electric Mfg. Co of Mankato, Minn., has opened a San Francisco office at 407 Sansome St. Irving Ballard is manager and August Keel is engineer. Ballard is also representative in northern California and Nevada and the Clapp Co. in southern California and Arizona for the Midwest Electric Products Co. of Mankato, makers of a remote control device soon to be put on the market.

● C. H. (Charlie) VOLZ is now southern California and Arizona district manager for Lynn & Chemnitz, Pacific Coast manufacturers' representatives. Volz formerly was associated with the Brown-Johnston Co. in Spokane and more recently with the Cannon Electric Development Co. of Los Angeles. Lynn & Chemnitz represent appliance, homeware and hardware lines; have offices in Seattle, San Francisco and Los Angeles.

● CLARK WATER HEATER Division of McGraw Electric Co. has opened a West Coast manufacturing plant at Azusa, Calif. Charles B. Mutter is manager and Lee G. Johns, Western district manager in charge of sales.

● LOCKE INSULATOR CORP. has transferred J. J. Dobel to Denver as manager. He formerly was in charge of the Kansas City office.

● V. J. MORRIS Co., which operates an electric appliance and housewares store at W. 515 Sprague Ave., Spokane, has opened a new branch store at Ninth and Grand avenues.

● J. B. HORTON and M. R. IVERSON have formed a partnership in the H. & I. Electric, 4142 Welwyn St., Vancouver, B.C.

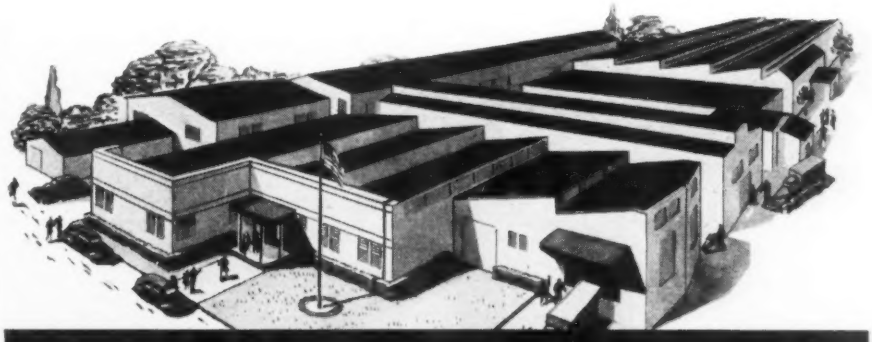
● PACIFIC WHOLESALE Co., San Francisco, has been appointed a distributor for Vocal-Aire sound system.

XIT

Speaking of

BRANDS

● Here in the West there's one brand that represents the finest in lighting equipment. The SMOOT-HOLMAN label on your fixture means certified quality . . . made in the West . . . for western use . . . for western delivery. It's a brand you can depend on.



SMOOT-HOLMAN COMPANY

INGLEWOOD, CALIFORNIA

Offices in Principal Western Cities • Branch and Warehouse in San Francisco

HOW TO MAKE POLES LAST LONGER

Just off the press. A factual booklet describing 12 years field experience with OSMOPLASTIC in ground line treatment of standing poles as well as other timbers. Explains the Osmoplastic method of treatment in detail. Write for your copy.

OSMOSE WOOD PRESERVING CO. OF AMERICA, INC. 1437 BAILEY AVE., BUFFALO 12, NEW YORK

Although the Western Metal Congress and Exposition at Oakland, Calif., civic auditorium last month was a metals show, there, as everywhere else, electricity played a major role. One of the many "stoppers" among exhibits was that of H. B. Squires Co., demonstrating Scientific Electric Co. dielectric and induction heaters. Plastic belts were "sewed" dielectrically and given as souvenirs. Among other electric exhibitors were PG and E, Los Angeles Department of Water & Power, General Electric, Westinghouse, Lincoln, North American Philips, Ohio Crankshaft, RCA, Reliance Electric & Engineering, Gordon Electronics, Lectrotech Co., and several electrically produced materials. Electrical techniques in welding, heat treating, microscopy, melting, electronic control and testing were discussed

● ERNEST WALL, who joined the Chase Engineering Co., S. 221 Monroe, in 1926 as a member of the service department, has announced that he has purchased William E. Chase's interests in the company. The firm was organized by Chase in 1905. Wall said the firm will continue servicing electrical units.

● ALLIED INDUSTRIES has moved from 451 S. Stewart St., Los Angeles, to 412 Seaton St., acording to Will H. Davie, its president.

● KENNETH M. ANDERSON manufacturer's representative, has recently moved from 334 E. 4th St., to 412 Seaton St., Los Angeles.

● FAIRBANKS, MORSE & Co., has recently added to its facilities a 100 x 200-ft. building at 306 Commercial St., Pomona, where it has installed a mechanized foundry. The plant also contains an assembly building for increased production of deep-well turbine pumps.

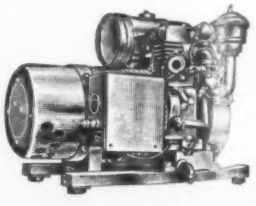
● L. W. ROSSITER has established an electrical contracting business at Campbell River, B.C., and will specialize in commercial and residential wiring. He is also handling some lines of electrical appliances.

● ROBERT M. TAYLOR has been named Western division head for Ray-O-Vac, with headquarters in San Francisco.

A. C. CURRENT ANYWHERE!
With KATOLIGHT PLANTS AND GENERATORS

Furnish the same kind of Current as the highlines. Sizes 500 watts to 100 KW. Also Manufacturers of Rotary Converters, Frequency Changers. 32 and 110 Volt D.C. Motors in ¼, ⅓ & ½ H.P. A.C. Motors, single phase in 1½ and 2 H.P. only.

KATOLIGHT 1411 First Ave., Mankato, Minn.



NATIONAL ENAMELDUCT AND ALUMADUCT CONDUIT

NATIONAL ENAMELING & MANUFACTURING CO.

PITTSBURGH, PENNA.

Agents in Principal Cities

ST. LOUIS 16, MO.
Harry C. Andrews Company
5440 Gravois Avenue
Telephone Hudson 7373

DETROIT 1, MICHIGAN
Block Brothers
415 Brainard Street
Telephone Temple 3-5800

PITTSBURGH 22, PA.
Crescent Sales Company
298 Duquesne Way
Telephone Grant 3833

BALTIMORE 2, MARYLAND
Electrical Sales Company
31 South Calvert Street
Telephone Calvert 3200

NEW YORK 7, NEW YORK
Corey Co., Inc.
81 Murray Street
Telephone Barclay 7-2494

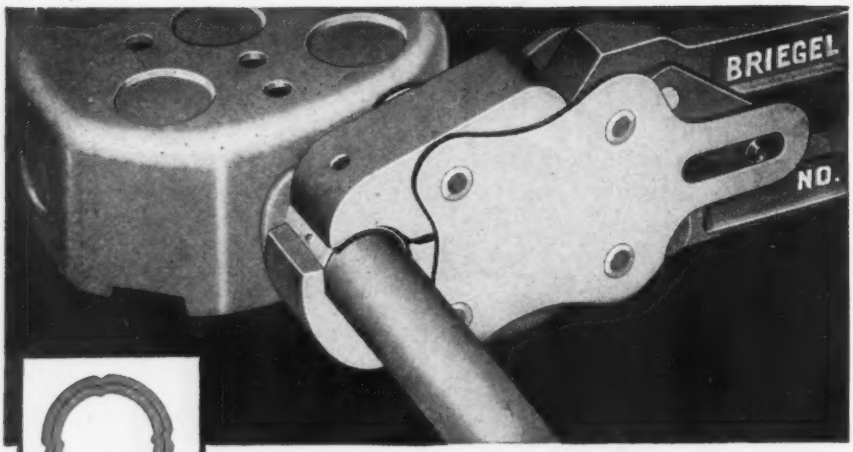
SAN FRANCISCO 3, CALIFORNIA
Keeler, White Company
615 Seventh Street
Telephone Hemlock 2900

SEATTLE 4, WASHINGTON
Keeler, White Company
1041 Sixth Avenue, South
Telephone Elliott 2367

PORTLAND 9, OREGON
Keeler, White Company
322 N. W. Fourth Avenue
Telephone Beacon 6764

DALLAS 1, TEXAS
Fred H. Simmer Company
103 Thomas Building
Telephone Riverside 2519

EXPORT
NEW YORK 10, N. Y., U. S. A.
M. J. Nye Company
15 East 26th Street
Telephone Lexington 2-3470



Cross section Showing Indentations.

E·M·T·UP THE QUICK WAY
Two Squeezes and it's Set

TWO QUICK SQUEEZES give you Finer, Faster Conduit Connections. B-M Fittings do away with the twisting, turning and tightening of nuts and save you valuable time and materials. Then too, they are stronger, neater and much easier to work with in tight places. Start using B-M Fittings today. Have more satisfied customers—more profits from each job!
(All B-M Fittings carry the Underwriters Seal of Approval)

DISTRIBUTED BY
The M. B. Austin Co., Chicago, Ill.
Clayton Mark & Co., Evanston, Ill.
Clifton Conduit Co., Jersey Cy., N. J.
Gen. Electric Co., Bridgeport, Conn.
The Steelduct Co., Youngstown, Ohio
Enameled Metals, Pittsburgh, Penn.
National Enameling & Mfg. Co., Pittsburgh, Pa.
Triangle Conduit & Cable Co., New Brunswick, N. J.

BM BRIEGEL METHOD TOOL CO. • Galva, Ill.

Get
MULTIFLEX BRUSHES
for

• IMPROVED COMMUTATION
• MORE UNIFORM WEAR
• LOWER OPERATING COSTS

U. S. Pat. 2,181,076

Yes, Helwig-Spear Multiflex Brushes give you the "big three" of motor and generator performance. The best in design and materials means: (1) uninterrupted contact, (2) reduced vibration, (3) reduced circulation current, even wear. What's more, you get double-brush advantages with single-brush simplicity. Multiflex fits conventional single-brush holders. For complete information on ordering brushes, write for Catalog 95.

PACIFIC COAST OFFICES
San Francisco.....116 New Montgomery St.; Garfield 3274
Seattle.....166 Jackson St.; Elliot 7133
Portland.....711 NW Everett St.; Beacon 3368
Los Angeles 611 W. Pico Blvd.; Prospect 8381
Denver.....1644 Blake St; Cherry 4425
Salt Lake City.....524 F. St.; Tel: 3-1600

HELWIG SPEER
HELWIG CO., Carbon Products
Makers of Multiflex and Transert Brushes

ALL KINDS
of SMALL
TRANSFORMERS

—in the JEFFRIES line

Practically all your small transformer needs are supplied by the Complete Jeffries line. We have specialized for years in providing transformers to exactly match your requirements. If not in our regular line, we build to meet your specifications—in a hurry!

Minimize your voltage losses. Specify scattered transformers to eliminate duplicate conduit runs, and save on power costs.

JEFFRIES TRANSFORMER COMPANY
1710 E. 57th St. Los Angeles 11, Calif.

NEWS ABOUT PEOPLE

Turnbull Coming West as G-E Vice-President

Ray W. Turnbull, president of Hotpoint Inc., has been appointed General Electric commercial vice-president for the Pacific District, with headquarters in San Francisco. He succeeds Raymond M. Alvord, who will retire Sept. 30, after 43 years of distinguished service.

Turnbull's career in the electric appliance business began in 1909 with the Southern California Edison Co. He joined General Electric three years later. After two years of service in the first World War, he went with Edison Electric Appliance Co. as Pacific Northwest sales manager. In 1924 he was moved to San Francisco as Pacific Coast manager and in 1931 went to Chicago headquarters as vice-president in charge of sales. He became president in 1941.

Alvord has been commercial vice-president, Pacific District, for nine years; has been in San Francisco with G-E for 41 years, coming West from Schenectady in 1906. He was made manager of the Pacific District apparatus department in 1936 and commercial vice-president two years later. He relinquished his responsibilities with the apparatus department in 1945 to become a member of G-E President Charles Wilson's staff.

● W. F. HYNES, for 20 years Northwestern district sales manager for General Electric Co.'s apparatus department, retired recently. He had been eligible for retirement late in 1941, but elected to remain with the company during the war. Following graduation from the University of California in 1898, he traveled extensively over the Western hemisphere supervising installation of electric equipment. He joined G-E in 1910 and has lived in Portland since that time. In 1927 he received the Charles Coffin certificate of merit for outstanding service.

● R. D. PAINE has been made manager of the G-E Oakland Lamp Works to succeed H. H. Barrows, who retired after almost 40 years with the company. Paine comes from Nela Park, where he has been cost engineer. Barrows joined the lamp department in Nela Park in 1908; became manager of the Oakland Lamp Works in 1913.

Turnbull

● LEONARD HOBBS, vice-president and general sales manager, Smoot-Holman Co., Los Angeles, is the first Westerner ever to be an officer in the RLM Institute, an association of industrial reflector manufacturers. He was recently elected secretary of the RLM group and R. W. Staud, Benjamin Electric & Mfg. Co., was re-elected president. Hobbs also served during the war on the Lighting Equipment Advisory Committee to the War Production Board as the Western representative.

● OKANOGAN COUNTY (Wash.) PUD has named Arthur Jacquot as its new manager to succeed PAUL HAND, manager since organization in 1935, who has accepted a similar position with the Central Lincoln county PUD at Newport, Ore. Jacquot was former district manager of the North Central District of the Bonneville Power Administration at Wenatchee, Wash.

● H. D. COMSTOCK has retired as USBR regional director at Billings, Mont. Kenneth F. Vernon, former assistant regional director, succeeds him. Comstock has been with the Reclamation service in the West for more than 41 years and will continue in a consulting capacity.

● J. H. JACOBUCCI, manager of the Southern Wyoming Utilities Co., at Green River, Wyo., retired recently after a lifetime spent in the electrical business. He was president of the Rocky Mountain Electrical League in 1938 and always active in its affairs.

● PAUL C. YELTON, former San Bernardino district manager of the California Electric Power Co., has been advanced to company construction engineer, replacing E. J. WAUGH, who has retired after 25 years of service.

Do resistor problems
"BURN YOU UP?"

Time was when a resistor consisted only of iron wire wound on a ceramic form—but that was long ago. Today, resistance unit specifications are so many and so varied that it requires the most extensive engineering application to solve the difficult problems they often embrace.

Here Driver-Harris lends a helping hand, with more than 80 electrical *resistance alloys*, designed to fill the numerous requirements of the Electrical and Electronic Industries. Best known and most widely used of this populous alloy family are — Nichrome* — Advance* — Manganin — Lohm* — and Midohm*. Singly, or in combination, these alloys are used in the majority of present-day resistance specifications—from precision bobbins to heavy-duty rheostats.

*Trade Mark Reg. U.S. Pat. Off.

Driver-Harris not only manufacturers and draws the most complete line of resistance alloys in the world — but also knows precisely how to use them. Get better acquainted with D-H alloys. Write for a copy of our latest 91-page Resistance Handbook R-46.

Driver-Harris COMPANY

Stocked for the Coast Trade at: ANGUS-CAMPBELL, INC.
235-241 San Bruno Ave., San Francisco • 449 So. San Pedro St., Los Angeles • 2122-4th Ave., Seattle
Main Office and Plant: HARRISON, NEW JERSEY

RELIANCE *AUTOMATIC* **TIME SWITCHES**

Model "W"

Completely automatic . . . extremely simple, compact, economical . . . three types cover practically every requirement . . .

Astronomic Time Switch

• The Model "W" Astronomic types are particularly popular for advertising illumination. The "on" operation changes daily to correspond with local sunset time, eliminating the necessity of re-setting the dial as the days become longer or shorter.

AMERICA'S RELIABLE
24 hour-a-day GUARDIANS

RELIANCE Time Switches have proved their dependability. They give complete and reliable service under many varied conditions — a factor of paramount importance when constant good service is essential. Send for catalog and price sheets for complete details.

RELIANCE AUTOMATIC LIGHTING CO.
1907 MEAD STREET RACINE, WISCONSIN

COST CONSCIOUS?
Then investigate PRITCHARD SERVICES and EQUIPMENT
DESIGNING • ENGINEERING
CONSTRUCTION • PIPING
Complete Plants • Additions • Installations
. . . every detail geared to more profitable operation

Veterans in electric power, water, steam and air facilities. Any part of comprehensive service is available separately.
POWER DIVISION • FIDELITY BLDG. • K. C., MO.
J.F. Pritchard & Co.
ENGINEERS • CONSTRUCTORS • MANUFACTURERS
for the CHEMICAL, PETROLEUM, GAS & POWER industries
Offices in key cities. See Sweets, Refinery Catalog, Chemical Engineering Catalog, etc.

We all know "It Pays To Advertise." It pays just as big to investigate WHAT IS ADVERTISED—every month in ELECTRICAL WEST

"A TORK CLOCK IS A FAMOUS NAME FOR TIME SWITCHES"

TORK CLOCKS
NOW WITH ASTRONOMIC DIALS
For all types of electrical switching and time control. Tork Time Clocks will control operations efficiently and automatically. Self-starting, all-electric. For minutes, hours, days or weeks. Special models designed to specifications.
Write for Bulletins
TORK CLOCK CO.
Mt. Vernon, N. Y.
WESTERN REPRESENTATIVES
George H. Curtiss, 222 29th St., Oakland 11. Veale Elec. Equip. Co., 445 E. 3rd Street, Los Angeles 13. Abbott Elec. Co., 1101 Eastlake Ave., Seattle 9. Stevens Sales Co., P. O. Box 2338, Salt Lake City 14. H. George Sheffer, P. O. Box 1587, Phoenix.

PRINTED CELLOPHANE ADHESIVE TAPE
TOPFLIGHT TAPE CO.
HUBER BLDG. — YORK, PA.

● RAYMOND P. FLINT has been appointed field representative of the Northern California Electrical Bureau, with headquarters in the Western Merchandise Mart, San Francisco, according to announcement by John S. C. Ross, chairman of the bureau's executive committee. Flint will take over the activities in the lighting field carried on by the late Clark Baker, and will also promote the Adequate Wiring program. Before affiliation with the bureau, Flint was sales engineer for Russell & Co., manufacturers' representatives. During the war he was with George G. Sharp, Naval architect, as Pacific Coast electrical field engineer; before the war, with the General Air Conditioning Co.

● R. L. HAYDEN was elected to the Coast Counties Gas & Electric Co. board of directors at last month's meeting. He has been general sales manager of the company since 1944 and before that was a division manager.

● WILLIAM H. MILTON Jr., who has been administrator of the G-E Hanford Engineer Works since September, has been elected G-E commercial vice-president for the District of Columbia.

● JOHN A. CUNEO has been named manager of Fairbanks, Morse & Co.'s Los Angeles branch, succeeding HARRY W. BROWN.

Deaths

● LESTER S. READY, 58, San Francisco consulting engineer, died of a heart attack early last month in Fresno, Calif. A native Californian, he was graduated from U of C with a degree in electrical engineering in 1912; worked for a short time with Pacific Gas and Electric Co. before starting service with the California Public Utilities Commission. He was chief engineer when he left the commission in 1927. Mr. Ready suffered the heart attack in Fresno city hall, where he had been attending committee meetings in connection with consulting work in that city. He was also consultant for the King's River Water Users Assn. and the Sacramento Municipal Utility District; at one time was consulting engineer for FPC. He had been appointed to the California Water Resources Board by Gov. Earl Warren.

● JAMES L. FAHEY, 41, from 1937 to 1946 district operating manager for General Electric Supply Corp. at Salt Lake City, died March 9 in Butte, Mont. At the time of his death he was manager of G-E Supply's Butte branch.

● FRED D. WEBER, who retired three years ago as secretary-treasurer of the Northwestern Section, International Association of Electrical Inspectors, died April 5, at his home in Hollywood, after a long illness. He had been electrical engineer for the Oregon Insurance Rating Bureau in Portland for many years, prominent in electrical affairs in the Northwest and at one time was president of IAEI. On his retirement he was made an honorary member of IAEI and often attended Southern California Chapter meetings.

● WILLIAM D. KANN, co-founder and president of the West Coast Electrical Works, died March 18 in Piedmont, Calif., at the age of 63. A native of Scranton, Pa., Mr. Kann had lived in the San Francisco Bay area for 40 years. He was a past president of the Oakland Electric Club.

● EDWARD J. NEIFING, 41, chief electrical engineer for the Cannon Electric Development Co., Los Angeles, died recently. Mr. Neifing came to Los Angeles from Chicago in 1925 to join Cannon.

● ROBERT R. RICHEY, 45, electrical engineer, died in San Diego March 31. He was employed by Westinghouse Electric Corp. for 22 years; resigned five years ago.

● CHESTER LOGAN BELDEN, 62, manager of the Montana Power Co. office in Livingston, Mont., died March 17.

WANTED
ELECTRICAL PROJECT ENGINEER
One (1) experienced graduate engineer, responsible charge electrical engineering and design of steam-electric and hydro-electric power plants and high voltage substations. Applicants please furnish personal data and Experience Record.
Box 122, Church St. Station P.O.
New York 6, N. Y.

UNIVERSAL'S ELECTRICIAN'S TOOLS: Dandy 10-pc. Set: Channelgrip Pliers, Vise Grips, Master Pipe Wrench, Crescent Wrench, Needle Nose Pliers, Cee-Tee Pliers, Screwdriver, Side-Cutter Pliers and Hammer, $19.85.
Remit Today—New Catalogue Free
UNIVERSAL TOOL COMPANY HAS IT
1527 Grand—EW5—Kansas City, Missouri

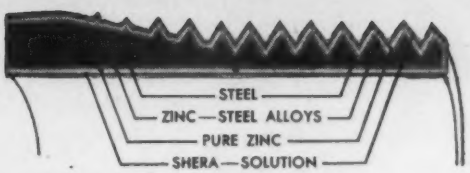
MOTORS, GENERATORS, TRANSFORMERS

1 — 1500 H.P.
Bought and Sold
New and Rebuilt
ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

SHERARDUCT—FULL WEIGHT, THREADED, RIGID STEEL CONDUIT

There is nothing temporary about SHERARDUCT! It's about the most permanent thing you can buy in wiring. Permanent because it is *Sherardized.* This provides maximum protection against *fire, acids, alkalies and other corrosive agents* . . . **provides lifetime mechanical protection to wires and cables.**

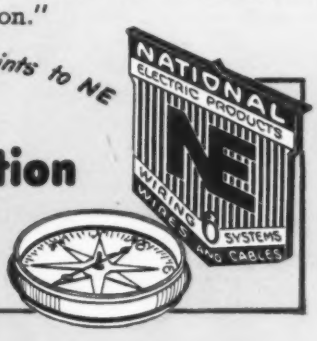
The SHERARDIZING process drives a pure zinc coating into the steel surface —alloys this coating to the steel tube. Then it is sealed with a special acid-proof, clear "Shera-Solution," baked on, for added durability. Thus, outside and inside surfaces, threads and ends of the conduit are all securely protected with both a zinc coating and the "Shera-Solution."



This combined coating will not split or peel, will not crack when the conduit is bent, offers years and years of complete protection.

Everything in wiring points to NE

National Electric Products Corporation
Pittsburgh 30, Pa.



INDEX TO ADVERTISERS

May 1947

Allen-Bradley Company 17, 18
Allis-Chalmers Mfg. Company 13, 29
Anaconda Wire & Cable 14, 15

Benjamin Electric Mfg. Co. 43
Brewer-Titchener Corp. 28
Briegel Method Tool Company 142
Buckingham Mfg. Co., Inc. 135
BullDog Electric Products Co. 12
Burndy Engineering Co., Inc. 7

Certified Ballasts Mfgrs. 30, 123
Chance Company, A. B. 20, 21
Classified 141
Cole Electric Company 34
Cornell-Dublier Electric Corp. 25
Crescent Insulated Wire & Cable 42
Crocker 1st National Bank 134
Crouse-Hinds Company 47
Curtis Lighting, Inc. 35, 36, 37, 38

Driver-Harris Company 143

Electric Equipment Company 144
Electromode Corporation 117

Faraday Electric Corp. 44
Four Wheel Drive Auto Company 49
Fuller & Company, W. P. 4, 5

General Electric Co.:
Bridgeport, Appliance & Merchandising Div. 22, 51, 60
Cleveland, Lamp Division 126, 127
Schenectady, Apparatus Div. 1, 8, 9, 33, 45
General Electric Supply Coropration 121
George Company, P. D. 53

Helwig Company 142
Holophane, Inc. 32
Honn Company, George E. 138

Ideal Industries, Inc. 130
Ilsco Copper Tube & Products, Inc. 138
Indiana Steel & Wire Company 134
Insulation Manufacturers Corp. 132
Irvington Varnish & Ins. Company 23

Jeffries Transformer Company 142
Johns-Manville Corporation 19

Kato Engineering Company 140
Kearney Corporation, James R. 10
Klein & Sons, Mathias 39

Leader Electric Mfg. Corp. 6
Lightolier Company 125
Line Material Company 3
Lloyd Products Company 48

Malleable Iron Range Company 115
Mitchell Mfg. Company 129
Moloney Electric Company 57

National Enameling & Mfg. Company 141
National Electric Products Corp. 145

Ohio Carbon Company 130
Okonite Company 27
Oliver Iron & Steel Corp. 56
Osmose Wood Preserving Co. of America 140
O Z Electrical Mfg. Company 26

Pacific Coast Electrical Assn. ..... 4th Cover
Pacific Gas and Electric Company ..... 3rd Cover
Paragon Electric Company 124
Pritchard & Company, J. F. 144

Royal Electric Company 50
RLM Standards Institute 131
Reliance Automatic Lighting 143
Robbins & Myers, Inc. 119

Sangamo Electric Company 16
Shell Oil Company 137
Simplex Wire & Cable Co. 46
Smoot-Holman Company 139
Sorgel Electric Company 52
Southern Calif. Edison Co. Ltd. ..... 2nd Cover
Southern States Equipment Company 21
Square D Company 133
Standard Oil Company 55

Topflight Tape Company 144
Tork Clock Company, Inc. 144
Trico Fuse Mfg. Company 138
Tri State Supply Corporations 132

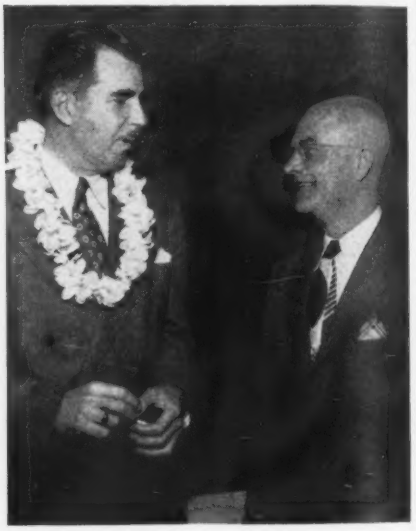
Union Pacific Railroad Company 11
United States Rubber Company 59
Up-Right Scaffold Company 138

Van Luven Company, H. H. 130

Wesix Electric Heater Company 122
Western Insulated Wire Company 54
Westinghouse Electric Corp.:
Bloomfield, Lamp Division 31
Pittsburgh 40, 41

PROFILES

Left: Marguerite Fenner, home service director for Pacific Gas and Electric Co. received the 1946 McCall award for home service at the Edison Electric Institute convention in Chicago last month. The plaque and $150 in government bonds was presented to Miss Fenner by H. M. Sawyer, chairman of the EEI prize awards committee. Only speaker from the far West at the four-day convention was O. R. Doerr, PG and E general sales manager, who reported for his area on the "Go All Electric" program being sponsored nationally by the NEMA



Last month a group of electric industry executives were guests of the Navy on the aircraft carrier, U.S.S Shangri-La, for a training cruise to Honolulu. Shown right are M. G. Sanders, PCEA president, and L. A. Hicks, president of Hawaiian Electric Co. Below on Shangri-La's flight deck: (back row) K. M Ryals, F. A. Tracy, W. G. Willson, Sanders, Capt. W. P. Cogswell, G. C. Tenney, Albert Cage, Charles Grunsky, E. D. Sherwin, I W. Borda, (front row) H. H. Courtright, H. H. Cleland, Rear Adm. S. P. Ginder, Brig. Gen. H. I. Hodes, S. E. Gates, H. B. Starkey

Footnotes* ...to the California Scene

SCENE 3: RECREATION – A Billion Dollars' Worth of Fun

Recreation and travel in California are **big** business. Pre-war vacationists annually caught 30 million fish and bagged 43 thousand deer, 4½ million game birds, a million rabbits. And they spent over half a billion dollars on sports, clothes, equipment, resorts and transportation. The result: next to manufacturing and agriculture, Fun is California's biggest business. Thanks to an increased population and Spirit of "play in California" the recreation industry should draw $1 billion this year.*

A REAL BOOSTER BEHIND THE SCENE

*To help make Northern California a better place to play, P. G. and E. plants trout (a million in 1947), raises game birds, builds fish "ladders" around its dams to expedite trout runs. In season we publish weekly bulletins of fish and stream conditions and open our property (where safe) for anglers. Our tax payments ($38 million this year) contribute substantially toward support of federal and state recreation facilities. We're proud to be a California citizen and to help make it the world's finest playground—winter and summer.

EW—105—547

P·G·and·E· PACIFIC GAS AND ELECTRIC COMPANY

"Always a leader . . . for the good of Northern California"

REMEMBER THE "BUSINESS END" OF APPLIANCE SELLING

Successful appliance selling is a double-barreled job: selling the appliance *and* selling adequate wiring. *Adequate wiring comes first*, because appliances can be sold *only* where they can be *used*.

In homes equipped with plenty of outlets, switches, and heavy enough wire, the job is half done. It's up to every appliance manufacturer and dealer—every member of the electrical industry—to promote proper wiring for new and remodeled homes. And every member of the industry will benefit for years to come.

PACIFIC COAST ELECTRICAL ASSOCIATION

601 W. Fifth St., Los Angeles 13, Calif. ★ 447 Sutter St., San Francisco 8, Calif.